

Supplemental Appendix: Place-Based Redistribution

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## A Net Within-Earnings Transfers to Distressed Locations Due to Marriage and Children

The United States conditions taxes and transfers on marital status and parental status in addition to earnings. The residents of distressed areas are less likely to be married and more likely to have children. To the extent that marital status and parental status serve as proxies to direct transfers to the residents of distressed areas within earnings levels, it is valuable to know if such net indirect transfers are substantial.

No publicly available micro dataset contains both fine geocoding as well as comprehensive measures of taxes and transfers. However, the 2016-2020 American Community Survey (ACS) provides tract-level counts of earnings $\times$ marriage $\times$ children cells, and the 2016-2020 Piketty et al. (2018) distributional national accounts (DINA) data provide estimates of total taxes and transfers by these same cells. We aggregate the tract-level ACS data to produce counts of families by these cells for “Distressed” (all forty urban and rural Empowerment Zones pooled) and “Elsewhere” (the rest of the country). We use those counts to produce mean within-earnings net taxes in Distressed and Elsewhere, equal to the community-specific marriage $\times$ children weighted average of DINA net taxes within each earnings cell, integrated over the *nationwide* earnings distribution. The difference between those two weighted averages equals our estimate of implicit place-based transfers.

Mathematically, we estimate the implicit place-based transfer to Distressed as

$$\mathbb{E}_z [\mathbb{E}_{mc|0z} [T(z, m, c)]] - \mathbb{E}_z [\mathbb{E}_{mc|1z} [T(z, m, c)]] \quad (12)$$

where  $z$  denotes earnings,  $m \in \{0, 1\}$  is an indicator for being married,  $c \in \{0, 1\}$  is an indicator for having children,  $T(z, m, k)$  denotes net taxes within each earnings $\times$ marriage $\times$ children cell,  $\mathbb{E}_z[\cdot]$  denotes the expectation over the nationwide distribution of earnings  $z$ ,  $\mathbb{E}_{mc|jz}[\cdot]$  denotes the expectation over community  $j$ ’s probability mass function of married-kids at earnings level  $z$ ,  $j = 0$  denotes Elsewhere, and where  $j = 1$  denotes Distressed.

The ACS data possess sixty-four earnings $\times$ married $\times$ children bins on resident families: {sixteen earnings groups}  $\times$  {married or unmarried}  $\times$  {has kids or does not have kids}. We aggregate the DINA data to the tax unit level and compute DINA taxes as all taxes gross of refundable tax credits minus social insurance contributions, which equals DINA’s main raw tax variable. DINA transfers are computed as all individualized benefits (e.g., refundable tax credits, medicaid, SNAP) minus social insurance benefits, which equals DINA’s main raw transfers variable minus collective consumption expenditure (e.g., national defense). DINA net taxes equals DINA taxes minus DINA transfers. DINA earnings equals fiscal income excluding capital gains (the `fninc` variable) inflated to 2020 dollars, which is similar to ACS’s “total income during the past 12 months” earnings concept for most of the income distribution.

As a first pass, we take the DINA data as given and report results in Panel A.i of [Appendix Table 1](#). Column 1 reports that the average family in Elsewhere pays \$842 less in net taxes annually than the average family in Distressed within earnings levels. Holding earnings constant, the demographic makeup of Distressed yields \$842 more in net taxes paid per family than in Elsewhere. That value is the sum of paying \$623 less in taxes and receiving \$220 more in transfers.

Column 4 row 3 repeats the analysis while ignoring marital status and reports  $\mathbb{E}_{zm} [\mathbb{E}_{c|0z} [T(z, m, c)]] - \mathbb{E}_{zm} [\mathbb{E}_{c|1z} [T(z, m, c)]]$ . Column 7 row 3 repeats the analysis while ignoring parental status and reports  $\mathbb{E}_{zc} [\mathbb{E}_{m|0z} [T(z, m, c)]] - \mathbb{E}_{zc} [\mathbb{E}_{m|1z} [T(z, m, c)]]$ . These results indicate that within-earnings differences in taxes and transfers by marital status drive most of the column 1 result.

A drawback to the preceding analysis is that the DINA data do not use children to impute all transfers. DINA federal taxes are drawn directly from public-use IRS tax returns, and state and local tax data can be imputed fairly reliably based on federal tax return information. However, transfers are often functions of variables not present in federal tax returns and are not always taken up. Consequently, the DINA data impute transfers using the Current Population Survey (CPS). Some imputations like Medicaid are performed within earnings-octile $\times$ married $\times$ number-of-children bins. However, due to thinner annual data, other DINA imputations like SNAP do not condition on children despite children being an important input to the SNAP benefits formula.

We therefore replace major DINA transfers available in the CPS: SNAP, TANF, Social Security Disability, Supplemental Security Income, veterans benefits, “other benefits” like utility bill reductions (which DINA imputes as a fraction of SNAP benefits), and Medicaid (though Medicaid benefits barely change as expected because DINA Medicaid benefits already condition on children). As in DINA, for each benefit, we blow up each cell’s amount by a constant factor across cells in order to maintain aggregates.

Panel A.ii reports results using the CPS-augmented DINA data. In accordance with transfers being greater for families with children, column 4 reports that considering only differences in parental status yield the average Elsewhere family paying \$130 more in net taxes than the average Distressed family within earnings levels. However, column 1 reports that when considering both marital status and parental status, the average Elsewhere family pays \$713 less in taxes. Hence, the CPS adjustment attenuates the DINA-only-based estimate toward zero while preserving its sign.

Overall, the CPS-adjusted estimates accord with intuition. Within earnings levels, taxes are on average lower for married families filing jointly than for single families. Transfers are also larger for married families within earnings levels, which is substantially driven by the fact that two adults rather than only one qualify for Medicaid and veterans health benefits. Transfers like SNAP are greater for families with children than those without. On net, however, the marital status differences dominate.

Panel A considered all families. Panel B repeats the analysis only for families earning \$30,000 or less, for whom taxes are much smaller and transfers are much larger. Panel B.i finds a trivial difference in net taxes between the two communities within these low earnings levels, as low-earners in Distressed enjoy a greater transfer advantage due to parental status and a smaller tax penalty due to marital status. Panel B.ii. similarly finds that the average low-earning Elsewhere family pays \$274 more in net taxes than the average low-earning Distressed family within earnings levels.

In sum, all of our column 1 net taxes estimates are below \$1,000 in magnitude and neither of our preferred CPS-augmented estimates indicate large *de facto* within-earnings transfers to Distressed locations due to marital and parental status differences. While our results are not entirely dispositive, these findings strongly suggest that redistribution between marital and parental demographic groups does not induce large transfers towards distressed areas.<sup>12</sup>

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<sup>12</sup>This exercise is not entirely dispositive because taxes and transfers are imputed to families in distressed areas based on the nationwide taxes and transfers within earnings, marriage, and children cells rather than measuring taxes and transfers directly. For example, if Distressed families with children have more children on average than Elsewhere families with children, our exercise could be biased against finding implicit place-based transfers to Distressed, as benefits like Medicaid and SNAP depend positively on the number of children.

## B Proofs and derivations

### B.1 Section 3

#### B.1.1 Landlords' problem

Omit subscripts  $j$  for simplicity. The landlords' problem is given by  $\max_H Hr - \varphi(H)$ , where  $\varphi(\cdot)$  is the cost of supplying housing. The FOC is given by  $r = \varphi'(H)$ . Assume  $\varphi(\cdot)$  is isoelastic with elasticity  $\varrho$

$$\varphi(H) = \frac{H}{\frac{1}{\varrho} + 1} \left( \frac{H}{H} \right)^{\frac{1}{\varrho} + 1}.$$

Then, the FOC implies that  $H = \underline{H}r^\varrho$ . Moreover

$$\Pi(r) = \max_H Hr - \frac{H}{\frac{1}{\varrho} + 1} \left( \frac{H}{H} \right)^{\frac{1}{\varrho} + 1} = \underline{H}r^\varrho r - \frac{H}{\frac{1}{\varrho} + 1} \left( \frac{\underline{H}r^\varrho}{H} \right)^{\frac{1}{\varrho} + 1} = \underline{H}r^{\varrho+1} \left( 1 - \frac{1}{\frac{1}{\varrho} + 1} \right) = \frac{\underline{H}r^{\varrho+1}}{1 + \varrho} = \frac{Hr}{1 + \varrho}.$$

### B.2 Section 4

#### B.2.1 Example 2 (sorting under comparative advantage)

If rents and amenities are identical in the two cities, we can normalize the indirect utility functions to

$$V_j(\Theta) = U(z_j^*(\theta)) - \psi\left(\frac{z_j^*(\theta)}{w_j(\theta)}\right) + j\phi.$$

The cutoff for sorting is

$$\phi_\theta = U(z_0^*(\theta)) - \psi\left(\frac{z_0^*(\theta)}{w_0(\theta)}\right) - U(z_1^*(\theta)) + \psi\left(\frac{z_1^*(\theta)}{w_1(\theta)}\right), \quad (\text{B.1})$$

where income is chosen optimally given wages according to the household first-order condition

$$U_c(z_j^*(\theta)) - \frac{1}{w_j(\theta)}\psi'\left(\frac{z_j^*(\theta)}{w_j(\theta)}\right) = 0. \quad (\text{B.2})$$

We aim to show that  $\frac{d\phi_\theta}{d\theta} > 0$ . Differentiating equation (B.1), plugging in equation (B.2), and using the envelope theorem yields

$$\frac{d\phi_\theta}{d\theta} = \frac{1}{\theta} (\gamma_0 z_0^*(\theta) U_c(z_0^*(\theta)) - \gamma_1 z_1^*(\theta) U_c(z_1^*(\theta))). \quad (\text{B.3})$$

To examine the sign of equation (B.3), note that the implicit function theorem applied to equation (B.2) (using  $U_{cc} < 0$  and  $\psi'' > 0$ ) yields

$$\frac{dz_j^*(\theta)}{dw_j(\theta)} > 0. \quad (\text{B.4})$$

We have that  $\gamma_0 > \gamma_1$  and  $z_0^*(\theta) \geq z_1^*(\theta)$ . This implies that  $\frac{d\phi_\theta}{d\theta} > 0$  so long as  $U$  is not too concave in  $c$  given  $\psi$ , that is, if

$$\frac{\gamma_0 z_0^*(\theta)}{\gamma_1 z_1^*(\theta)} > \frac{U_c(z_1^*(\theta))}{U_c(z_0^*(\theta))},$$

which, at the optimum, simultaneously means that  $\psi$  is not too convex in  $l$  given  $U$ . Note that a sufficient condition is that  $xU(x)$  is non-decreasing in  $x$ , a condition is met in the functional form considered in the numerical simulations,  $U(x) = \log(x)$ .

### B.2.2 Example 3 (sorting under income-based sorting)

Given that wages and amenities are identical in the two locations, we can normalize wages to  $\theta$  and write the indirect utility function as

$$V_j(\Theta) = U(z_j^*(\theta) - r_j) - \psi\left(\frac{z_j^*(\theta)}{\theta}\right) + j\phi.$$

The cutoff for sorting is

$$\phi_\theta = U(z_0^*(\theta) - r_0) - \psi\left(\frac{z_0^*(\theta)}{\theta}\right) - U(z_1^*(\theta) - r_1) + \psi\left(\frac{z_1^*(\theta)}{\theta}\right),$$

where income is chosen optimally given rents according to the household first-order condition

$$U_c(z_j^*(\theta) - r_j) = \frac{1}{\theta}\psi'\left(\frac{z_j^*(\theta)}{\theta}\right) \quad (\text{B.5})$$

We aim to show that  $\frac{d\phi_\theta}{d\theta} > 0$ , so that higher skill households sort into the expensive location. Using the envelope theorem applied to income choice, we have

$$\frac{d\phi_\theta}{d\theta} = \frac{1}{\theta}(z_0^*(\theta)U_c(z_0^*(\theta) - r_0) - z_1^*(\theta)U_c(z_1^*(\theta) - r_1)). \quad (\text{B.6})$$

To examine the sign of equation (B.6), note that

$$\frac{dU_c(z_j^*(r_j) - r_j)}{dr_j} = U_{cc}(z_j^*(\theta) - r_j) \left(\frac{dz_j^*(\theta)}{dr_j} - 1\right). \quad (\text{B.7})$$

The implicit function theorem applied to equation (B.5) yields

$$\frac{dz_j^*(\theta)}{dr_j} = \frac{U_{cc}(z_j^*(\theta) - r_j)}{U_{cc}(z_j^*(\theta) - r_j) - \frac{1}{\theta^2}\psi''\left(\frac{z_j^*(\theta)}{\theta}\right)}.$$

Then,  $U_{cc} < 0$  and  $\psi'' > 0$  implies that  $\frac{dz_j^*(\theta)}{dr_j} \in (0, 1)$ . Plugging this into equation (B.7) yields  $\frac{dU_c(z_j^*(r_j) - r_j)}{dr_j} > 0$ . Finally,  $\frac{dz_j^*(\theta)}{dr_j} > 0$  implies that  $z_0^*(\theta)U_c(z_0^*(\theta) - r_0) > z_1^*(\theta)U_c(z_1^*(\theta) - r_1)$  whenever  $r_0 > r_1$ , hence  $\frac{d\phi_\theta}{d\theta} > 0$ .

## B.3 Section 6

### B.3.1 Proposition 1

At the optimal  $t^*$ ,  $\frac{dSWF}{dt} = 0$ , where  $\frac{dSWF}{dt} = \frac{dW}{dt} + \frac{dB}{dt}$ . Equations (6) and (7) account for  $\frac{dW}{dt}$  and  $\frac{dB}{dt}$  when starting from  $t = 0$ . When  $t \neq 0$ , movers from Elsewhere to Distressed stop paying  $\frac{t^*}{L_0}$  and start receiving  $\frac{t^*}{L_1}$ , so the  $\frac{dB}{dt}$  term is augmented by  $t^*$  per mover, generating an additional fiscal externality of

$\frac{t^* \mathbb{E}_\theta[m(t^*)]}{L_0 L_1}$ . The result then proceeds from isolating  $t^*$  from  $\frac{dW}{dt} + \frac{dB}{dt} = 0$  after correcting the term  $\frac{dB}{dt}$ .

### B.3.2 Section 6 results under alternative specifications of locational preferences

Rather than assuming that idiosyncratic choices of locations are driven by additive preference heterogeneity as in the main text, we consider here a more general formulation where households have idiosyncratic productivity in both locations, as well as idiosyncratic preferences for location. They are therefore characterized by  $\Theta = \{w_0, w_1, \phi\}$  distributed according to the CDF  $F(\cdot)$ . Furthermore, we do not restrict the preference heterogeneity to enter additively in the utility function. That is, we assume that

$$u_j(\Theta) = U\left(c, h, a_j, \frac{z}{w_j}, \phi\right).$$

We first discuss how the results carry through to these more general cases. We then discuss the pitfalls of non-additive idiosyncratic preferences in the context of normative questions.

The logic of the derivations in Section 6 is unchanged, but notations need to be adjusted. In particular, we define the share of households who live in Distressed when the transfer is of size  $t$  as

$$L_1(t) = \int_{\Theta \in \mathbb{R}^4} j^*(\Theta, t) dF(\Theta).$$

We have

$$\frac{dL_1}{dt} = \lim_{t \rightarrow 0} \int_{\Theta \in \mathbb{R}^4} \left[ \frac{j^*(\Theta, t) - j^*(\Theta, 0)}{t} \right] dF(\Theta)$$

The fiscal cost of movers still corresponds to the earnings losses of movers, which now writes more generally

$$\begin{aligned} \frac{dB}{dt} &= \lim_{t \rightarrow 0} \int_{\Theta \in \mathbb{R}^4} \left[ \frac{[j^*(\Theta, t) - j^*(\Theta, 0)] [T(z_1^*(\Theta, t)) - T(z_0^*(\Theta, 0))]}{t} \right] dF(\Theta) \\ &= \lim_{t \rightarrow 0} \int_{\Theta \in \mathbb{R}^4} \left[ \frac{[j^*(\Theta, t) - j^*(\Theta, 0)] [T(z_1^*(\Theta, 0)) - T(z_0^*(\Theta, 0))]}{t} \right] dF(\Theta) \end{aligned}$$

where the last line follows because  $T(z_1^*(\Theta, t)) = T(z_1^*(\Theta, 0))$ : absent an income effect on labor supply, stayers do not adjust their earnings following a lump-sum tax/subsidy. We write this expression with a more convenient notational shortcut

$$\begin{aligned} \frac{dB}{dt} &= \mathbb{E}[T(z_1^*(\Theta, 0)) - T(z_0^*(\Theta, 0)) | move] P(move) + \mathbb{E}[T(z_1^*(\Theta, 0)) - T(z_0^*(\Theta, 0)) | stay] P(stay) \\ &= \mathbb{E}[T(z_1^*(\Theta, 0)) - T(z_0^*(\Theta, 0)) | move] \frac{dL_1}{dt} \end{aligned}$$

Lemma 1 writes as follows (nothing is changed in the equity computations, only in the efficiency cost computations): The first order effect on welfare of a small PBR reform starting from a place-blind system is

$$\frac{dSWF}{dt} = \bar{\lambda}_1 - \bar{\lambda}_0 + \frac{dL_1}{dt} \mathbb{E}_\Theta \{ [T(z_1^*(\cdot, 0)) - T(z_0^*(\cdot, 0))] | move \} \quad (\text{B.8})$$

Similar notational adjustments hold for Proposition 1. Technical results are therefore similar to what is in

the main text with an additive formulation of idiosyncratic preferences, except that they call for a more cumbersome notation. We now discuss the advantage of choosing additively separable idiosyncratic preferences for location when it comes to normative questions.

**Pitfalls of non-additive idiosyncratic tastes** With additively separable idiosyncratic preferences for location, the social welfare weights  $\lambda(\Theta)$  are not direct functions of the idiosyncratic preference  $\phi$  - they are only indirectly impacted by idiosyncratic preferences through their effect on choice of city  $j$ . The reason why this is an advantage is that welfare weights – hence welfare implications of policies – do not depend on the specification and values of the unobserved taste  $\phi$ , they only depend on the observed location choice  $j$ . In contrast, when the  $\lambda$ 's directly depend on the value of  $\phi$ , the definition of  $\phi$  obviously matters for welfare. Unfortunately, as we show in the example below, one can easily build examples where two alternative models of  $\phi$  lead to observationally equivalent equilibria, hence they cannot be disentangled using data, but have opposite welfare implications. It makes it undesirable to rest a normative argument on such a model.<sup>13</sup> Finally, it is easy to see that a similar argument applies to the case where idiosyncratic preferences for location are additively separable but the planner has concave preferences over levels of indirect utility, i.e.  $SWF = \int G(V^\Theta) d\Theta$ .

**Example** Assume that households are indexed by  $(\theta, \varepsilon_0, \varepsilon_1)$  where the  $\varepsilon$ 's are idiosyncratic preferences for 0 and 1. They have the simple utility function

$$U(c + \varepsilon_j)$$

with  $U(\cdot)$  concave. Households supply labor inelastically. Type  $\theta$  gets income  $z_j(\theta)$  in city  $j$ . Households choose city  $j = 1$  iff

$$U(z_1(\theta) + \varepsilon_1) > U(z_0(\theta) + \varepsilon_0),$$

i.e., iff

$$\varepsilon_1 - \varepsilon_0 > z_0(\theta) - z_1(\theta). \quad (\text{B.9})$$

Note that the values of  $\varepsilon_1$  and  $\varepsilon_0$  separately play no role in any of the observable choices of households, so that  $\varepsilon_1$  and  $\varepsilon_0$  are not separately identified. We then consider two alternative models: in model (a),  $\varepsilon_0 = 0$  while  $\varepsilon_1 = \phi$  is an iid random variable with some positive variance. In model (b),  $\varepsilon_1 = 0$  while  $\varepsilon_0 = -\phi$ . Both models can rationalize the exact same sorting equilibrium. The two models are therefore observationally equivalent. Interestingly though, they have opposite welfare (place-based related) implications. To make the point very stark, assume that  $z_0(\theta) = z_1(\theta) (\equiv z(\theta))$ . We compute  $\lambda(\Theta)$  the social welfare weight of type  $\Theta = \{\theta, \phi\}$  in city  $j$

$$\lambda(\Theta) = U'(z(\theta) + \varepsilon_j) \frac{1}{\Gamma}$$

We now compare  $\lambda_0$  in location 0 to  $\lambda_1$  in location 1, which correspond to the same income, to determine the direction of desirability of redistribution across locations implied by the two models. In both models, households are in 1 iff  $\phi > 0$ .

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<sup>13</sup>Davis and Gregory (2022) discuss a related point: multiplicative preference heterogeneity, commonly used in Economic Geography model, is typically not identified but influences the marginal utility of consumption, and therefore social preferences. They propose to adjust the planner's problem to neutralize the influence of these preferences on marginal utility of consumption.

Therefore, given that  $U$  is concave, and  $\phi > 0$  when 1 is chosen, we have in model (a)

$$\lambda_1 = U'(z + \phi) \frac{1}{\bar{I}} < U'(z) \frac{1}{\bar{I}} = \lambda_0$$

and redistribution from 1 to 0 is desirable.

In model (b),  $\phi > 0$  too when 1 is chosen, so  $\phi \leq 0$  when 0 is chosen. Therefore, in contrast to model (a)

$$\lambda_1 = U'(z) \frac{1}{\bar{I}} > U'(z - \phi) \frac{1}{\bar{I}} = \lambda_0$$

and redistribution from 0 to 1 is desirable. We conclude that two observationally-equivalent model predict opposite directions of redistribution. This example illustrate the pitfalls of allowing welfare weights to directly depend on idiosyncratic tastes, rather than indirectly based on city choice only.

### B.3.3 Example 4 (stylized case of place-based redistribution desirability under skill-taste correlation)

The fact that  $\bar{\lambda}_1 - \bar{\lambda}_0 > 0$  follows directly from Example 1. Although Example 1 assumes away taxes, the argument holds for any place-blind tax system because it only requires optimal earnings to be the same across locations. Conditional on  $j$ , the FOC for earnings is given by

$$[1 - T'(z_j^*(\theta))]w(\theta) = \psi' \left( \frac{z_j^*(\theta)}{w(\theta)} \right).$$

Because of the lack of income effects,  $t$  does not affect labor supply. No other primitive is location-specific, so  $z_0^*(\theta) = z_1^*(\theta)$ , for all  $\theta$ . Then, the fiscal externality departing from  $t = 0$  is zero, yielding the result.

### B.3.4 Example 5 (stylized case of place-based redistribution desirability under comparative advantage)

Assume  $\theta \in [\underline{\theta}, \bar{\theta}]$ , with  $\underline{\theta} \geq 0$  and  $\bar{\theta} < \infty$ , and that  $\omega(\theta)$  is decreasing in  $\theta$ . We consider the utility function

$$z - T(z) - r_j + a_j - \frac{\eta}{1 + \eta} \left( \frac{z}{w_j(\theta)} \right)^{\frac{1+\eta}{\eta}} + j\phi$$

and a wage function  $w_1(\theta) = \theta$  for all  $\theta$ ,  $w_0(\theta) = \theta$  if  $\theta < \theta^*$ , and  $w_0(\theta) = \theta + b$  if  $\theta \geq \theta^*$ , with  $b > 0$  and  $\theta^* \in (\underline{\theta}, \bar{\theta})$ . WLOG, we assume that  $a_0 = a_1 = r_0 = r_1 = 0$ .

The condition that guarantees that a household  $(\theta, \phi)$  prefers Elsewhere is  $\phi \leq \phi_\theta$ , with  $\phi_\theta = v_0(\theta) - v_1(\theta)$ , where  $v_j(\theta)$  is the indirect sub-utility when residing in  $j$ . Since the wage is the only primitive that varies across place, and, therefore, the only place-specific primitive that affects labor supply, we have that  $z_j^*(\theta) = z^*(w_j(\theta))$ . Therefore, we can rewrite  $v_j(\theta) \equiv \mathcal{V}(w_j(\theta))$ , where  $\mathcal{V}(w_j(\theta)) = z^*(w_j(\theta)) - T(z^*(w_j(\theta))) - \frac{\eta}{1+\eta} \left( \frac{z^*(w_j(\theta))}{w_j(\theta)} \right)^{\frac{1+\eta}{\eta}}$ , so  $\phi_\theta = \mathcal{V}(w_0(\theta)) - \mathcal{V}(w_1(\theta))$ .

When  $\theta < \theta^*$ ,  $w_0(\theta) = w_1(\theta)$ , so  $\phi_\theta = 0$ . When  $\theta \geq \theta^*$ , define  $z_D(\theta)$  as the optimal earnings when facing the wage schedule of Distressed, that is,  $z_D(\theta) = \arg \max_z \left( z - T(z) - \frac{\eta}{1+\eta} \left( \frac{z}{w_1(\theta)} \right)^{\frac{1+\eta}{\eta}} \right)$ . Assume

$z_D(\theta) > 0$  for all  $\theta \geq \theta^*$ .<sup>14</sup> Then, for  $\theta \geq \theta^*$

$$\begin{aligned}\mathcal{V}(w_1(\theta)) &= z_D(\theta) - T(z_D(\theta)) - \frac{\eta}{1+\eta} \left( \frac{z_D(\theta)}{w_1(\theta)} \right)^{\frac{1+\eta}{\eta}} \\ &< z_D(\theta) - T(z_D(\theta)) - \frac{\eta}{1+\eta} \left( \frac{z_D(\theta)}{w_0(\theta)} \right)^{\frac{1+\eta}{\eta}} \\ &\leq \mathcal{V}(w_0(\theta)),\end{aligned}$$

where we used that  $w_0(\theta) > w_1(\theta)$ , for all  $\theta \geq \theta^*$ . It follows that  $\phi_\theta > 0$  for all  $\theta \geq \theta^*$  and, therefore, that  $\min_{\theta \in [\theta^*, \bar{\theta}]} \phi_\theta \equiv \phi_\theta^{\min} > 0$ .<sup>15</sup>

Consider the introduction of a small place-based transfer  $t$  such that  $(\phi_\theta^{\min} - \bar{\phi}) > t > 0$ . We now show that this transfer can be welfare improving in two separate cases.

**Case with no taste heterogeneity** Assume  $\phi$  equals  $\bar{\phi}$  for all individuals, with  $0 < \bar{\phi} < \phi_\theta^{\min}$ . It follows that  $G(0) = 0$  and  $G(\phi_\theta^{\min}) = 1$ . Thus, all individuals with  $\theta < \theta^*$  inframarginally locate in Distressed, and all individuals with  $\theta \geq \theta^*$  inframarginally locate in Elsewhere. It follows that the transfer  $t$  is unambiguously welfare-improving starting from a place-blind tax system. For  $\theta \geq \theta^*$ ,  $\phi_\theta \geq \phi_\theta^{\min} - t$ , which implies  $\phi_\theta > \bar{\phi}$ . Hence, no type with  $\theta \geq \theta^*$  moves in response to the tax reform if  $t < \phi_\theta^{\min} - \bar{\phi}$ . Likewise, individuals with  $\theta < \theta^*$  remain inframarginal given that  $t > 0$ . Thus, the reform does not generate fiscal externalities. Since  $\omega(\theta)$  decreases with  $\theta$ , the reform generates equity gains. Therefore, the reform is welfare-improving.

**Case with taste heterogeneity** Consider a taste distribution  $G_\theta(\phi)$  with support  $[\underline{\phi}, \bar{\phi}]$ , where  $\underline{\phi} < 0$  and  $0 < \bar{\phi} < \phi_\theta^{\min}$ . Individuals with  $\theta \geq \theta^*$  remain inframarginally located in Elsewhere and do not migrate after the introduction of  $t$ . Since 0 is in the support of  $G_\theta$ , individuals with  $\theta < \theta^*$  split between the two communities. Suppose  $G_\theta(0)$  does not depend on  $\theta$ . Then all types  $\theta < \theta^*$  have the same split between communities. Hence, after the introduction of  $t$ , a share of individuals with  $\theta < \theta^*$  may migrate to Distressed. However, any such moves will not have fiscal effects because these individuals do not change their earnings after migrating. Therefore, the introduction of  $t$  is welfare-improving.

### B.3.5 Example 6 (place-based redistribution is superfluous under income-based sorting and homogeneous preferences)

Consider an equilibrium with place-blind tax system  $T(\cdot)$  and place-based transfers  $t_j$ , where  $t_j$  is a lump-sum tax on  $j$ . Utility is given by  $U(z - T(z) - t_j - r_j, a_j) - \psi(\frac{z}{\theta})$ , with  $U_c > 0$ ,  $U_{cc} < 0$ ,  $\psi'' > 0$ . An individual with income  $z$  is located in  $j(z) = \arg \max_j \{U(z - T(z) - t_j - r_j, a_j)\}$  and gets an (indirect) sub-utility of consumption denoted  $V(z, T(\cdot), t_0, t_1)$ . We show that, in this context, place-based transfers are superfluous compared to using the income tax alone.

The proof closely follows [Kaplow \(2006\)](#). Consider a new tax system  $\tilde{T}(z)$  with no place-based transfers, which is chosen such that  $\forall z$ ,  $V(z, T(\cdot), t_0, t_1) = V(z, \tilde{T}(\cdot), 0, 0)$ . Such a tax schedule exists due to the continuity of the sub-utility  $U(z, a)$  in income. Since  $V(z, T(\cdot), t_0, t_1) - \psi(\frac{z}{\theta}) = V(z, \tilde{T}(\cdot), 0, 0) - \psi(\frac{z}{\theta})$  by construction of  $\tilde{T}(\cdot)$  for all  $z$ , individuals make the same optimal choice of labor  $z$  in the new tax system

<sup>14</sup>Any incentive compatible tax system should incentivize individuals with  $\theta > 0$  to have positive labor supply. Then, this assumption is innocuous if we assume the tax system is optimal.

<sup>15</sup>To see why, consider any convergent sequence  $\theta^{(n)}$  with  $\theta^{(n)} \in [\theta^*, \bar{\theta}]$  such that  $\phi_\theta^{(n)} \geq \phi_\theta^{(n+1)}$ . Denote the limit as  $(\theta^{\lim}, \phi_\theta^{\lim})$ . Because  $[\theta^*, \bar{\theta}]$  is closed, then  $\theta^{\lim} \in [\theta^*, \bar{\theta}]$ , so  $\phi_\theta^{(n)} \geq \phi_\theta^{\lim} > 0$ .

(this result comes from the assumption of separability of labor disutility). Therefore, individuals have the same utility as with the initial tax system.

We now show that under this new tax system, government revenues increase. First, for individuals whose choice of  $j$  did not change, taxes paid are unchanged. Second, consider individuals who changed their location choice from  $i$  to  $j \neq i$  because they strictly prefer  $j$  to  $i$ . Since  $i$  was their optimal choice initially,  $V(z, T(\cdot), t_0, t_1) = U(z - \tilde{T}(z) - r_i, a_i)$ . Now assume (by contradiction) that under the new tax system where  $j$  is strictly preferred to  $i$ , the individual could still afford the initial city  $i$ . Since they can afford it but don't choose it, it must be that  $V(z, \tilde{T}(\cdot), 0, 0) = U(z - \tilde{T}(z) - r_j, a_j) > U(z - \tilde{T}(z) - r_i, a_i)$ , where the first equality is the definition of the indirect utility in the new equilibrium, and the inequality comes from the assumption that one can still afford  $i$  but does not choose it. In turn,  $V(z, T(\cdot), t_0, t_1) > U(z - \tilde{T}(z) - r_i, a_i)$ , using the the sub-utility of consumption did not change by construction of the new tax schedule. This yields a contradiction. It follows that these individuals cannot afford  $i$  in the new equilibrium, i.e.  $z - \tilde{T}(z) - r_i < 0$ , while initially  $z - T(z) - t_i - r_i = 0$ . It follows that  $\tilde{T}(z) > T(z) + t_i$ , so that these individuals pay more taxes and government revenues increase.

We have built an income tax reform that gets rid of place-based transfers, keeps the utility of all individuals constant and increases government revenues. Hence, the place-based transfers were superfluous. This argument holds for an arbitrary  $T$  function; in particular, for the optimal one.

## B.4 Section 7

### B.4.1 Proposition 2

With the assumption that the utility function satisfies single-crossing, we proceed by solving the “relaxed” version of the screening problem that replaces the global incentive compatibility constraints with local incentive compatibility constraints that become sufficient when allocations are monotone in skill within each location. We take the usual approach of dropping the monotonicity condition, solving the resulting version of the planning problem, and then verifying monotonicity ex-post in our numerical simulations.

Following the notation developed in the main text, let indirect sub-utilities be denoted by  $v_j(\theta)$  and indirect utility be denoted by  $V_j(\theta, \phi) = v_j(\theta) + j\phi$ . Let  $j^*(\theta, \phi)$  denote optimal location decision given primitives  $(\theta, \phi)$ . Then, we define  $V(\theta, \phi) = j^*(\theta, \phi)V_1(\theta, \phi) + (1 - j^*(\theta, \phi))V_0(\theta, \phi)$  as the utility of individuals of type  $(\theta, \phi)$  at the optimal location decision. We similarly define  $T(\theta, \phi)$  as the taxes paid by individuals of type  $(\theta, \phi)$  at the optimal location decision. Using the the definition of  $\phi_\theta$ , housing demands are given by  $H_0^D(r) = \int_{\underline{\theta}}^{\bar{\theta}} G_\theta(\phi_\theta) f(\theta) d\theta$  and  $H_1^D(r) = \int_{\underline{\theta}}^{\bar{\theta}} (1 - G_\theta(\phi_\theta)) f(\theta) d\theta$ , where  $f(\theta) = dF(\theta)$  is the pdf of  $\theta$  and housing rents,  $r = (r_0, r_1)$ , are implicit in  $\phi_\theta$ . To simplify notation, the derivation omits the asterisk superscript to denote optimal decisions since incentive compatibility ensures that outcome.

The planner's problem consists on maximizing the social welfare function (SWF) subject to incentive compatibility constraints, total budget constraint, and housing market clearing conditions. As discussed in the main text, we consider Pareto weights  $\omega_H(\theta)$  that are only functions of skill  $\theta$ . WLOG, we normalize weights on renters so that they sum to 1 across skills:  $\mathbb{E}_\theta[\omega_H] = \int_{\underline{\theta}}^{\bar{\theta}} \omega_H(\theta) f(\theta) d\theta = 1$ . Since the planner does not observe  $(\theta, \phi)$ , she is constrained to second-best allocations with taxes as a function of earnings and

location. The problem can be written as

$$\begin{aligned}
& \max_{c,z,T} \int_{\underline{\theta}}^{\bar{\theta}} \omega_H(\theta) \left[ \int_{\underline{\phi}}^{\bar{\phi}} V(\theta, \phi) g_{\theta}(\phi) d\phi \right] f(\theta) d\theta + \omega_L [\Pi_0(r_0) + \Pi_1(r_1)], \\
& \text{s.t. } \int_{\underline{\theta}}^{\bar{\theta}} \left[ \int_{\underline{\phi}}^{\bar{\phi}} T(\theta, \phi) g_{\theta}(\phi) d\phi \right] f(\theta) d\theta \geq R, \\
& \int_{\underline{\theta}}^{\bar{\theta}} (G_{\theta}(\phi_{\theta}) - \underline{H}_0 r_0^{e_0}) f(\theta) d\theta = 0, \quad \int_{\underline{\theta}}^{\bar{\theta}} ([1 - G_{\theta}(\phi_{\theta})] - \underline{H}_1 r_1^{e_1}) f(\theta) d\theta = 0, \\
& \text{and } \forall \theta', \phi' : \hat{V}(\theta, \phi; \theta, \phi) \geq \hat{V}(\theta', \phi'; \theta, \phi),
\end{aligned}$$

where  $g_{\theta}(\phi) = dG_{\theta}(\phi)$  is the marginal conditional distribution of  $\phi$  given  $\theta$  and  $\hat{V}(\theta', \phi'; \theta, \phi)$  is the utility an individual of type  $(\theta, \phi)$  gets from mimicking an individual of type  $(\theta', \phi')$ , with  $\hat{V}(\theta, \phi; \theta, \phi) = V(\theta, \phi)$ . The first constraint is the budget constraint. The second constraints are the housing market equilibrium in both locations. The third set of constraints are the incentive compatibility constraints.

Recalling that  $\phi_{\theta} = v_0(\theta) - v_1(\theta)$ , we can write

$$\int_{\underline{\phi}}^{\bar{\phi}} V(\theta, \phi) g_{\theta}(\phi) d\phi = v_0(\theta) G_{\theta}(\phi_{\theta}) + v_1(\theta) (1 - G_{\theta}(\phi_{\theta})) + \int_{\phi_{\theta}}^{\bar{\phi}} \phi g_{\theta}(\phi) d\phi. \quad (\text{B.10})$$

Also, let  $\Psi(., a)$  be the inverse (reciprocal) of  $U(., a)$ , which is well-defined since  $U_c > 0$ . Then, we can write

$$T_j(z_j(\theta)) = z_j(\theta) - \Psi\left(v_j(\theta) + \psi\left(\frac{z_j(\theta)}{w_j(\theta)}\right), a_j\right) - r_j.$$

We denote by  $\Psi_j(\theta)$  the function  $\Psi(., a)$  evaluated at the optimum of types  $\theta$  residing in  $j$ .

With these expressions, we can recast the mechanism design problem that precedes as an optimal control problem. We define the set  $x_j = \{x_j(\theta)\}$  as the collection of  $x_j(\theta)$  for all  $\theta$ , for  $x \in \{v, z, r\}$ . Then, the planner's problem can be expressed as

$$\begin{aligned}
& \max_{v_0, v_1, z_0, z_1, r_0, r_1} \int_{\underline{\theta}}^{\bar{\theta}} \omega_H(\theta) \left[ v_0(\theta) G_{\theta}(\phi_{\theta}) + v_1(\theta) (1 - G_{\theta}(\phi_{\theta})) + \int_{\phi_{\theta}}^{\bar{\phi}} \phi g_{\theta}(\phi) d\phi \right] f(\theta) d\theta \\
& + \int_{\underline{\theta}}^{\bar{\theta}} \omega_L (\Pi_0(r_0) + \Pi_1(r_1)) f(\theta) d\theta, \\
& \text{s.t. } \int_{\underline{\theta}}^{\bar{\theta}} \left\{ \left[ z_0(\theta) - \Psi\left(v_0(\theta) + \psi\left(\frac{z_0(\theta)}{w_0(\theta)}\right), a_0\right) - r_0 \right] G_{\theta}(\phi_{\theta}) \right. \right. \\
& \quad \left. \left. + \left[ z_1(\theta) - \Psi\left(v_1(\theta) + \psi\left(\frac{z_1(\theta)}{w_1(\theta)}\right), a_1\right) - r_1 \right] (1 - G_{\theta}(\phi_{\theta})) \right\} f(\theta) d\theta \geq R, \quad (\Gamma) \\
& \text{and } \int_{\underline{\theta}}^{\bar{\theta}} (G_{\theta}(\phi_{\theta}) - \underline{H}_0 r_0^{e_0}) f(\theta) d\theta = 0, \quad \int_{\underline{\theta}}^{\bar{\theta}} ([1 - G_{\theta}(\phi_{\theta})] - \underline{H}_1 r_1^{e_1}) f(\theta) d\theta = 0, \quad (\chi_j) \\
& \text{and } \forall \theta, j : r'_j(\theta) = 0, \quad (A_j(\theta)) \\
& \text{and } \forall \theta, j : v'_j(\theta) = \psi'\left(\frac{z_j(\theta)}{w_j(\theta)}\right) z_j(\theta) \left(\frac{\frac{\partial}{\partial \theta} w_j(\theta)}{w_j(\theta)^2}\right). \quad (\mu_j(\theta))
\end{aligned}$$

The optimal tax problem, then, is equivalent to choosing allocations of earnings, utility, and rents that

maximize welfare subject to respecting the government budget constraint, the housing market equilibrium, and the incentive compatibility constraint. These allocations can then be implemented with the tax system according to the expressions above. To accommodate notation and definitions to the optimal control setup, we treat housing rents as state variables, so we introduce the law of movement of rents that imposes constant rents within location across skills ( $r'_j(\theta) = 0$ ) and, therefore, we indistinctly use  $r_j$  and  $r_j(\theta)$  below. In this problem,  $\Gamma$  is the budget constraint multiplier,  $\chi_j$  are the multipliers of the housing market clearing conditions,  $A_j(\theta)$  are the multipliers for the within-location constant rents constraint, and  $\mu_j(\theta)$  is the multiplier of the incentive compatibility (IC) constraint. Note that, given the separability assumption on  $\phi$ , the “intensive margin” IC constraints are unchanged compared to the standard optimal income tax problem. The location choice IC constraint is explicitly incorporated in the objective function and constraints by substituting for  $j^*(\theta, \phi)$  using the threshold rule based on  $\phi_\theta$ .<sup>16</sup>

Assuming no bunching, we can derive the optimal schedule of location-specific taxes by solving the following Hamiltonian by pointwise maximization

$$\begin{aligned} H(\theta) = & \omega_H(\theta) \left( v_0(\theta) G_\theta(\phi_\theta) + v_1(\theta) (1 - G_\theta(\phi_\theta)) + \int_{\phi_\theta}^{\bar{\phi}} \phi g_\theta(\phi) d\phi \right) f(\theta) + \omega_L [\Pi_0(r_0) + \Pi_1(r_1)] f(\theta) \\ & + \Gamma \left\{ \left[ z_0(\theta) - \Psi \left( v_0(\theta) + \psi \left( \frac{z_0(\theta)}{w_0(\theta)} \right), a_0 \right) - r_0 \right] G_\theta(\phi_\theta) \right. \\ & + \left. \left[ z_1(\theta) - \Psi \left( v_1(\theta) + \psi \left( \frac{z_1(\theta)}{w_1(\theta)} \right), a_1 \right) - r_1 \right] (1 - G_\theta(\phi_\theta)) \right\} f(\theta) \\ & + \chi_0 (G_\theta(\phi_\theta) - \underline{H}_0 r_0^{e_0}) f(\theta) + \chi_1 ([1 - G_\theta(\phi_\theta)] - \underline{H}_1 r_1^{e_1}) f(\theta) \\ & + \sum_j \mu_j(\theta) \psi' \left( \frac{z_j(\theta)}{w_j(\theta)} \right) z_j(\theta) \left( \frac{\frac{\partial}{\partial \theta} w_j(\theta)}{w_j(\theta)^2} \right) + \sum_j A_j(\theta) \cdot 0, \end{aligned}$$

where the state vectors are  $(v_0, v_1, r_0, r_1)$  and the control vectors are  $(z_0, z_1)$ . To simplify notation, below we denote  $\frac{\partial w_j(\theta)}{\partial \theta} = w'_j(\theta)$ . A set of sufficient condition to maximize  $H(\theta)$  is given by

$$\frac{\partial H(\theta)}{\partial v_j(\theta)} = -\mu'_j(\theta), \quad \frac{\partial H(\theta)}{\partial r_j} = -A'_j(\theta), \quad \frac{\partial H(\theta)}{\partial z_j(\theta)} = 0,$$

and the transversality conditions  $\mu_j(\underline{\theta}) = \mu_j(\bar{\theta}) = A_j(\underline{\theta}) = A_j(\bar{\theta}) = 0$ , for  $j \in \{0, 1\}$ .

To solve for the first-order-condition (FOC) with respect to  $z_j(\theta)$ , note that  $\Psi'_j(\theta) = \frac{1}{\frac{dU_{c_j}(\theta)}{dc_j(\theta)}} = \frac{1}{\frac{dU_{c_j}(\theta)}{dz_j(\theta)}}$ , where  $\Psi'_j(\theta)$  is the derivative of the function  $\Psi(\cdot, a)$  with respect to its argument, evaluated at the optimal

<sup>16</sup>Since location is observed, the IC constraint states that  $\forall \theta', \theta : \hat{v}_j(\theta; \theta) \geq \hat{v}_j(\theta'; \theta)$  within each location, where  $\hat{v}_j(\theta'; \theta) = c_j(\theta') - \psi \left( \frac{z_j(\theta')}{w_j(\theta)} \right)$  and  $\hat{v}_j(\theta; \theta) = v_j(\theta)$ . The “revelation problem” of each household solves

$$\max_{\theta'} c_j(\theta') - \psi \left( \frac{z_j(\theta')}{w_j(\theta)} \right),$$

which in an incentive compatible allocation optimally leads to  $\theta' = \theta$ . The first-order-condition is given by  $\frac{d}{d\theta'} \left[ c_j(\theta') - \psi \left( \frac{z_j(\theta')}{w_j(\theta)} \right) \right] = 0$  evaluated at  $\theta' = \theta$ . Then,  $\frac{d}{d\theta} v_j(\theta) = \frac{d}{d\theta'} \left[ c_j(\theta') - \psi \left( \frac{z_j(\theta')}{w_j(\theta)} \right) \right]_{\theta'=\theta} - \frac{\partial}{\partial \theta} \left[ \psi \left( \frac{z_j(\theta')}{w_j(\theta)} \right) \right]_{\theta'=\theta} = \psi' \left( \frac{z_j(\theta)}{w_j(\theta)} \right) \frac{z_j(\theta) w'_j(\theta)}{w_j(\theta)^2}$ , where the last equality uses the first-order-condition. The IC constraint becomes

$$v'_j(\theta) = \psi' \left( \frac{z_j(\theta)}{w_j(\theta)} \right) \frac{z_j(\theta) w'_j(\theta)}{w_j(\theta)^2}.$$

In the standard problem,  $w'_j(\theta) = 1$ , which yields the standard expression for the IC constraint.

choices of types  $\theta$  located in  $j$ . Then,  $\Psi'_j(\theta) = \frac{1}{U_{cj}(\theta)}$ , where  $U_{cj}(\theta)$  is the marginal utility of consumption evaluated at the optimal allocation which, as discussed in the main text, is a key input to the marginal welfare weight computation. We also note that, conditional on  $v_j(\theta)$ ,  $\frac{d\phi_\theta}{dz_j(\theta)} = 0$ . Then

$$\begin{aligned}\Gamma f(\theta) G_\theta(\phi_\theta) \left[ 1 - \frac{1}{U_{c0}} \frac{1}{w_0(\theta)} \psi' \left( \frac{z_0(\theta)}{w_0(\theta)} \right) \right] + \mu_0(\theta) \frac{w'_0(\theta)}{w_0(\theta)} \frac{1}{w_0(\theta)} \left[ \psi'' \left( \frac{z_0(\theta)}{w_0(\theta)} \right) \frac{z_0(\theta)}{w_0(\theta)} + \psi' \left( \frac{z_0(\theta)}{w_0(\theta)} \right) \right] &= 0, \\ \Gamma f(\theta) (1 - G_\theta(\phi_\theta)) \left[ 1 - \frac{1}{U_{c1}} \frac{1}{w_1(\theta)} \psi' \left( \frac{z_1(\theta)}{w_1(\theta)} \right) \right] + \mu_1(\theta) \frac{w'_1(\theta)}{w_1(\theta)} \frac{1}{w_1(\theta)} \left[ \psi'' \left( \frac{z_1(\theta)}{w_1(\theta)} \right) \frac{z_1(\theta)}{w_1(\theta)} + \psi' \left( \frac{z_1(\theta)}{w_1(\theta)} \right) \right] &= 0.\end{aligned}$$

The FOC of the individual households is given by  $(1 - T'_j(z_j(\theta))) = \frac{\psi' \left( \frac{z_j(\theta)}{w_j(\theta)} \right) \frac{1}{w_j(\theta)}}{v'_{cj}}$ . Then, by differentiating  $U_{cj}$  and properly manipulating terms, we can write utility primitives as a function of elasticities (see [Saez \(2001\)](#) for details)

$$\eta_j^U(\theta) = \frac{\frac{\psi' \left( \frac{z_j(\theta)}{w_j(\theta)} \right)}{\ell_j(\theta)} + \frac{\psi'(\ell_j(\theta))^2}{U_{cj}^{*2}} U'_{cj}}{\psi''(\ell_j(\theta)) - \frac{\psi'(\ell_j(\theta))^2}{U_{cj}^2} U'_{cj}}, \quad \eta_j^C(\theta) = \frac{\frac{\psi'(\ell_j(\theta))}{\ell_j(\theta)}}{\psi''(\ell_j(\theta)) - \frac{\psi'(\ell_j(\theta))^2}{U_{cj}^2} U'_{cj}},$$

where  $\ell_j(\theta) = \frac{z_j(\theta)}{w_j(\theta)}$ . Then we can write

$$\frac{1 + \eta_j^U(\theta)}{\eta_j^C(\theta)} = \frac{\psi''(\ell_j(\theta)) + \frac{\psi'(\ell_j(\theta))}{\ell_j(\theta)}}{\frac{\psi'(\ell_j(\theta))}{\ell_j(\theta)}}. \quad (\text{B.11})$$

This implies that

$$\psi'' \left( \frac{z_j(\theta)}{w_j(\theta)} \right) \frac{z_j(\theta)}{w_j(\theta)} + \psi' \left( \frac{z_j(\theta)}{w_j(\theta)} \right) = \psi' \left( \frac{z_j(\theta)}{w_j(\theta)} \right) \left[ \frac{1 + \eta_j^U(\theta)}{\eta_j^C(\theta)} \right],$$

so the planner's FOC with respect to  $z_j(\theta)$  reduces to

$$\Gamma f(\theta) G_\theta(\phi_\theta) \left[ 1 - \frac{1}{U_{c0}} \frac{1}{w_0(\theta)} \psi' \left( \frac{z_0(\theta)}{w_0(\theta)} \right) \right] + \mu_0(\theta) \frac{\gamma_0(\theta)}{\theta} \frac{1}{w_0(\theta)} \psi' \left( \frac{z_0(\theta)}{w_0(\theta)} \right) \left[ \frac{1 + \eta_0^U(\theta)}{\eta_0^C(\theta)} \right] = 0, \quad (\text{B.12})$$

$$\Gamma f(\theta) (1 - G_\theta(\phi_\theta)) \left[ 1 - \frac{1}{U_{c1}} \frac{1}{w_1(\theta)} \psi' \left( \frac{z_1(\theta)}{w_1(\theta)} \right) \right] + \mu_1(\theta) \frac{\gamma_1(\theta)}{\theta} \frac{1}{w_1(\theta)} \psi' \left( \frac{z_1(\theta)}{w_1(\theta)} \right) \left[ \frac{1 + \eta_1^U(\theta)}{\eta_1^C(\theta)} \right] = 0 \quad (\text{B.13})$$

where we replaced  $\gamma_j(\theta) = \frac{w'_j(\theta)\theta}{w_j(\theta)}$ .

Noting that  $\frac{\partial \phi_\theta}{\partial v_0(\theta)} = \frac{\partial(v_0(\theta) - v_1(\theta))}{\partial v_0(\theta)} = 1$ , the FOC with respect to  $v_0(\theta)$  yields

$$\omega_H(\theta) G_\theta(\phi_\theta) f(\theta) - \Gamma \frac{1}{U_{c0}(\theta)} G_\theta(\phi_\theta) f(\theta) - \Gamma \Delta\tau(\theta) g_\theta(\phi_\theta) f(\theta) + (\chi_0 - \chi_1) g_\theta(\phi_\theta) f(\theta) = -\mu'_0(\theta),$$

where we used the notation  $\Delta\tau(\theta) = T_1(z_1(\theta)) - T_0(z_0(\theta))$ . Also, the envelope theorem implies no first order welfare effect through the sorting decisions.<sup>17</sup> To solve for  $\chi_j$ , consider the FOC with respect to  $r_0$

$$\omega_L \Pi'_0(r_0) f(\theta) - \Gamma G_\theta(\phi_\theta) f(\theta) - \chi_0 \varrho_0 \underline{H}_0 r_0^{\varrho_0-1} f(\theta) = -A'_0(\theta).$$

<sup>17</sup>The total derivative of the first term within the planner's objective equals  $G_\theta(\phi_\theta) + v_0(\theta)g_\theta(\phi_\theta) - v_1(\theta)g_\theta(\phi_\theta) - \phi_\theta g_\theta(\phi_\theta)$ , so terms cancel out considering that  $\phi_\theta = v_0(\theta) - v_1(\theta)$ . Intuitively, marginal movers experience no welfare effect since they are indifferent between locations.

The transversality conditions imply  $\int_{\underline{\theta}}^{\bar{\theta}} A'_0(\theta) = 0$ . Also, the envelope theorem applied to the landlords' implies  $\Pi'_0(r_0) = H_0$ , with  $H_0 = \underline{H}_0 r_0^{\underline{\theta}_0}$  total housing supply in location 0.<sup>18</sup> Noting that integrating  $G_{\theta}(\phi_{\theta}) f(\theta)$  yields total housing demand in location 0 which, in equilibrium, is equal to  $H_0$ , integrating the previous expression over  $\theta$  implies that  $\chi_0 = \frac{(\omega_L - \Gamma)r_0}{\underline{\theta}_0}$ . A similar logic solves for  $\chi_1$ . Then, the FOC with respect to  $v_0(\theta)$  can be reduced to:

$$\begin{aligned} \omega_H(\theta) G_{\theta}(\phi_{\theta}) f(\theta) - \Gamma \frac{1}{U_{c0}(\theta)} G_{\theta}(\phi_{\theta}) f(\theta) - \Gamma \Delta \tau(\theta) g_{\theta}(\phi_{\theta}) f(\theta) \\ + (\omega_L - \Gamma) \left( \frac{r_0}{\underline{\theta}_0} - \frac{r_1}{\underline{\theta}_1} \right) g_{\theta}(\phi_{\theta}) f(\theta) = -\mu'_0(\theta). \end{aligned} \quad (\text{B.14})$$

An analog expression can be derived from the FOC with respect to  $v_1(\theta)$

$$\omega_H(\theta) (1 - G_{\theta}(\phi_{\theta})) f(\theta) - \Gamma \frac{1}{U_{c1}(\theta)} (1 - G_{\theta}(\phi_{\theta})) f(\theta) + \Gamma \Delta \tau(\theta) g_{\theta}(\phi_{\theta}) f(\theta) \quad (\text{B.15})$$

$$- (\omega_L - \Gamma) \left( \frac{r_0}{\underline{\theta}_0} - \frac{r_1}{\underline{\theta}_1} \right) g_{\theta}(\phi_{\theta}) f(\theta) = -\mu'_1(\theta). \quad (\text{B.16})$$

Because of the transversality conditions,  $-\int_{\underline{\theta}}^{\bar{\theta}} \mu'_j(\theta) d\theta = 0$ . Then, adding the two FOCs with respect to  $v_j(\theta)$ , (B.14) and (B.16), integrating and using  $\int_{\underline{\theta}}^{\bar{\theta}} \omega_H(\theta) f(\theta) d\theta = 1$  yields

$$\Gamma = \left( \int_{\underline{\theta}}^{\bar{\theta}} \left( \frac{1}{U_{c0}(\theta)} G_{\theta}(\phi_{\theta}) + \frac{1}{U_{c1}(\theta)} (1 - G_{\theta}(\phi_{\theta})) \right) f(\theta) d\theta \right)^{-1},$$

so the marginal value of public funds coincides with the harmonic mean of the marginal utility of consumption across types and locations. Note that this expression makes clear why  $\int_{\underline{\theta}}^{\bar{\theta}} \omega_H(\theta) f(\theta) d\theta = 1$  is WLOG, since for computing welfare weights, any set of Pareto weights that do not average to one will not play any role in the numerator (beyond its normalized version) after properly scaling the budget constraint multiplier.

In the final step, we solve out for the functions  $\mu_j(\theta)$  that appear in the FOCs with respect to  $z_j(\theta)$  and those with respect to  $v_j(\theta)$ . Specifically, we note that, since  $\mu_j(\bar{\theta}) = 0$ ,  $\mu_j(\theta) = -\int_{\theta}^{\bar{\theta}} \mu'_j(\theta) d\theta$ . We then solve out for  $\mu_0(\theta)$  in (B.12) by integrating  $\mu'_0(\theta)$  over  $\theta$  in (B.14) and equating the two. Plugging in the FOC of the household optimal income problem<sup>19</sup> leads to the following expression for  $j = 0$

$$\begin{aligned} \frac{T'_0(z_0(\theta))}{1 - T'_0(z_0(\theta))} &= \left( \frac{1 + \eta_0^U(\theta)}{\eta_0^C(\theta)} \right) \frac{\gamma_0(\theta)}{\theta f(\theta) G_{\theta}(\phi_{\theta})} \\ &\times U_{c0}(\theta) \left\{ \int_{\theta}^{\bar{\theta}} \frac{1 - \lambda_0(s)}{U_{c0}(s)} G_s(\phi_s) f(s) ds + \Delta \tau^+(\theta) + (\lambda_L - 1) \Delta r^+(\theta) \right\}, \end{aligned}$$

where we used the shorthands  $\Delta \tau^+(\theta) \equiv \int_{\theta}^{\bar{\theta}} [T_1(z_1^*(s)) - T_0(z_0^*(s))] g_s(\phi_s) dF(s)$ ,  $\Delta r^+(\theta) \equiv \left( \frac{r_1}{\underline{\theta}_1} - \frac{r_0}{\underline{\theta}_0} \right)$ .

<sup>18</sup>The profit maximization problem for the landlords is  $\Pi_j = \max_{H_j} H_j r_j - \varphi(H_j)$  where  $\varphi(H_j)$  is the cost function for housing supply, so the envelope theorem implies that  $\Pi'_j(r_j) = H_j$ . Optimal housing supply  $H_j = \underline{H}_j r_j^{\underline{\theta}_j}$  arises then as the optimal solution when cost functions have standard isoelastic forms (see Appendix B.1).

<sup>19</sup>The FOC in location  $j$  is:  $1 - T'_j(z) = \frac{\psi'(\frac{z}{w_j(\theta)})}{v'_j(c)} \frac{1}{w_j(\theta)}$

$\int_{\underline{\theta}}^{\bar{\theta}} g_s(\phi_s) dF(s)$ ,  $\lambda_j(\theta) = \frac{\omega_H(\theta)U_{cj}(\theta)}{\Gamma}$ , and  $\lambda_L = \frac{\omega_L}{\Gamma}$ . A similar procedure yields

$$\begin{aligned} \frac{T'_1(z_1(\theta))}{1 - T'_1(z_1(\theta))} &= \left( \frac{1 + \eta_1^U(\theta)}{\eta_1^C(\theta)} \right) \frac{\gamma_1(\theta)}{\theta f(\theta) (1 - G_\theta(\phi_\theta))} \\ &\times U_{c1}(\theta) \left\{ \int_{\underline{\theta}}^{\bar{\theta}} \frac{1 - \lambda_1(s)}{U_{c1}(s)} (1 - G_s(\phi_s)) f(s) ds - \Delta\tau^+(\theta) - (\lambda_L - 1) \Delta r^+(\theta) \right\}. \end{aligned}$$

Finally, to derive equation (10), we use the transversality condition  $\int_{\underline{\theta}}^{\bar{\theta}} -\mu'_0(\theta) d\theta = 0$ . Computing  $\int_{\underline{\theta}}^{\bar{\theta}} -\mu'_0(\theta) d\theta$  from equation (B.14) yields

$$\int_{\underline{\theta}}^{\bar{\theta}} (\lambda_0(\theta) - 1) \frac{1}{U_{c0}(\theta)} G_\theta(\phi_\theta) f(\theta) d\theta - \Delta\tau^+(\underline{\theta}) - (\lambda_L - 1) \Delta r^+(\underline{\theta}) = 0. \quad (\text{B.17})$$

A similar expression can be derived by using the transversality condition for  $j = 1$

$$\int_{\underline{\theta}}^{\bar{\theta}} (\lambda_1(\theta) - 1) \frac{1}{U_{c1}(\theta)} (1 - G_\theta(\phi_\theta)) f(\theta) d\theta + \Delta\tau^+(\underline{\theta}) + (\bar{\omega}_L - 1) \Delta r^+(\underline{\theta}) = 0. \quad (\text{B.18})$$

Multiplying (B.18) by  $L_0$  and subtracting (B.18) multiplied by  $L_1$  yields

$$\begin{aligned} L_0 L_1 \int_{\underline{\theta}}^{\bar{\theta}} \left( \frac{1}{L_1} (\lambda_1(\theta) - 1) \frac{1}{U_{c1}(\theta)} (1 - G_\theta(\phi_\theta)) - \frac{1}{L_0} (\lambda_0(\theta) - 1) \frac{1}{U_{c0}(\theta)} G_\theta(\phi_\theta) \right) f(\theta) d\theta \\ + \Delta\tau^+(\underline{\theta}) + (\bar{\omega}_L - 1) \Delta r^+(\underline{\theta}) = 0. \end{aligned}$$

## C Simulation Appendix

### C.1 Additional relevant formulas

The following already-specified equations are used in the simulations: equations (8)-(10) (optimal taxes), (11) (parametric utility), and (B.4.1) (optimal multiplier). In addition, the following equations are used.

The conditional density of location tastes specified in Section 8 can be expressed as

$$g_\theta(\phi) = \frac{\exp\left(\frac{\phi - \mu + \beta F(\theta)}{\kappa}\right)}{\kappa \left(1 + \exp\left(\frac{\phi - \mu + \beta F(\theta)}{\kappa}\right)\right)^2} = \frac{1}{\kappa} G_\theta(\phi) (1 - G_\theta(\phi)).$$

Social marginal welfare weights on households are given by

$$\lambda_j(\theta) = \frac{1}{\Gamma \cdot (z_j(\theta) - T_j(z_j(\theta)) - r_j)},$$

where  $\Gamma$  is the budget constraint multiplier characterized in equation (B.4.1). The welfare weight on landlords is given by  $\lambda_L = \omega_L/\Gamma$ .

From equation (B.11) under our iso-elastic functional form, we have

$$\frac{1 + \eta_j^U(\theta)}{\eta_j^C(\theta)} = 1 + \frac{1}{\eta}.$$

which reduces the optimal marginal tax rate formulas to

$$\begin{aligned}\frac{T'_0(z_0(\theta))}{1 - T'_0(z_0(\theta))} &= \left(1 + \frac{1}{\eta}\right) \frac{\gamma_0}{\theta f(\theta) G_\theta(\phi_\theta)} \\ &\quad \times U_{c0}(\theta) \left\{ \int_{\theta}^{\bar{\theta}} \frac{1 - \lambda_0(s)}{U_{c0}(s)} G_s(\phi_s) dF(s) + \Delta\tau^+(\theta) + (\lambda_L - 1) \Delta r^+(\theta) \right\}, \\ \frac{T'_1(z_1(\theta))}{1 - T'_1(z_1(\theta))} &= \left(1 + \frac{1}{\eta}\right) \frac{\gamma_1}{\theta f(\theta) (1 - G_\theta(\phi_\theta))} \\ &\quad \times U_{c1}(\theta) \left\{ \int_{\theta}^{\bar{\theta}} \frac{1 - \lambda_1(s)}{U_{c1}(s)} (1 - G_s(\phi_s)) dF(s) - \Delta\tau^+(\theta) - (\lambda_L - 1) \Delta r^+(\theta) \right\},\end{aligned}$$

where  $U_{cj}(\theta) = (z_j(\theta) - T_j(z_j(\theta)) - r_j)^{-1}$ .

## C.2 Simulation procedure

**Discrete skill distribution** We work with a discrete approximation of the problem in  $\theta$ -space. Consider a grid of  $\theta$  of size  $N$ , such that  $\theta \in \{\theta_1, \dots, \theta_N\}$  with  $\theta_1 = \underline{\theta}$ ,  $\theta_N = \bar{\theta}$ , and  $\theta_i - \theta_{i-1} = \hat{\Delta}$  for all  $i$  and with  $\hat{\Delta} = (\bar{\theta} - \underline{\theta})/(N-1)$  denoting the equally-sized bin width. The functions  $T_j(z_j(\theta))$  are approximated by piecewise linear tax systems with  $N$  different brackets for each  $j$ , where each income threshold is determined by the type-location-specific optimal earnings given the tax schedule. Concretely, let  $T_j(z_j(\theta))$  be characterized by a demogrant intercept  $T_j(z_j(\underline{\theta})) = -E_j$  and  $N$  marginal tax rates,  $T'_{ji} = T'_j(z_j(\theta_i))$ . Then

$$T_j(z_j(\theta_i)) = -E_j + \sum_{k=1}^i T'_{ji} \cdot (z_j(\theta_k) - z_j(\theta_{k-1})),$$

where  $z_j(\theta_0)$  is normalized to 0 for  $j \in \{0, 1\}$ .

The discretization of  $\theta$  also implies that  $F$  is approximated by a discrete CDF  $\hat{F}$  with corresponding PMF  $\hat{f}$ :

$$\hat{f}(\theta_i) = F\left(\theta_i + \frac{\hat{\Delta}}{2}; \xi, \sigma, p\right) - F\left(\theta_i - \frac{\hat{\Delta}}{2}; \xi, \sigma, p\right),$$

with  $\hat{F}(\theta_i) = \sum_{k=1}^i \hat{f}(\theta_k)$ . The PMF is normalized such that  $\hat{F}(\theta_N) = 1$ .

We closely follow [Mankiw et al. \(2009\)](#) (MWY) for simulating the discrete PMF of  $\theta$ . To ensure a mass of non-workers, we define  $\underline{\theta} = 0$  and set  $\hat{f}(0) = 0.05$  as in MWY. We create an evenly-spaced grid of 50 points from zero to  $\theta = 42.5$ , the point in which MWY append the Pareto tail. This implies that  $\hat{\Delta} = 0.867$ . For each point in this grid, we impute the PMF using the equation above, where  $F$  is the log-normal CDF evaluated at parameters  $\xi = 2.757$  and  $\sigma = 0.5611$ , as estimated by MWY.<sup>20</sup>

We then build a second vector representing the Pareto tail with parameter  $p = 2$  of the distribution by sequentially incrementing the  $\theta$ -grid by the bin-width  $\hat{\Delta}$ . Appending the Pareto tail vector to the previous vector yields a 578-entry  $\theta$ -vector with a maximum value of  $\bar{\theta} = 500.5$ . We again recover the probabilities pertaining to each bin by applying the equation above using as  $F$  the Pareto CDF, as in MWY. Finally, we normalize the PMF to ensure the probabilities add up to one and are continuous at  $\theta = 42.5$ .

<sup>20</sup>The only exception is that we round up the lowest positive  $\theta$  from 0.867 to 1, in order for comparative advantage to always yield higher wages in Elsewhere. This has no quantitative impact on our results.

**Calibration** In Section 8, we fix  $\kappa$  and find a solution of three unknowns to match the three moments as specified in the text. We proceed in Matlab by solving the non-linear system of equations using the `fsolve` command. In all calibrations, we test for multiple solutions by running local solvers on fine grids of initial conditions using `multistart`. In Section 9, we find a solution including  $\kappa$  as a fourth unknown and a migration elasticity (0.82 in the urban scenarios and 0.20 in the rural scenarios) as the fourth moment as specified in the text. This additional moment is jointly solved with the other three. To compute the additional simulated moment, we artificially increase the wage shifter  $W$  in Distressed by 1%, which should yield a population increase of 0.82% in the urban scenarios and 0.20% in the rural scenarios after the endogenous change in rents has been internalized. In this exercise, we exclude the mass point at  $\theta = 0$  since, by construction, those households are not responsive to changes in  $W$  because their labor supply is always zero.

**Optimization** To solve for the optimal tax system given a set of calibrated parameters, we proceed by solving a non-linear system of  $2N + 2 + 2$  equations in  $2N + 2 + 2$  unknowns, again by using Matlab's `fsolve` command. The unknowns are  $2N$  marginal tax rates,  $\{T'_{ji}\}_{j \in \{0,1\}, i \in \{1, \dots, N\}}$ , defined for each type in each location, 2 community-specific tax system intercepts,  $\{E_j\}_{j \in \{0,1\}}$ , and 2 rent prices,  $\{r_j\}_{j \in \{0,1\}}$ . The  $2N + 2 + 2$  equations to solve are listed below. In what follows, it will be useful to write  $T_j(z_j(\theta_i)) = -E_j + t_j(z_j(\theta_i))$ , where  $t_j(z_j(\theta_i)) = \sum_{k=1}^i T'_{ji} \cdot (z_j(\theta_k) - z_j(\theta_{k-1}))$  are gross taxes paid excluding the demogrant as defined above.

- i. The routine solves for the discrete approximation of the MTR location-specific FOCs. To simplify notation, let  $G_i = G_\theta(\phi_{\theta_i})$  and  $g_i = g_\theta(\phi_{\theta_i})$ . Then the  $2N$  equations associated with the  $2N$  MTR unknowns are given by:

$$\begin{aligned} \frac{T'_{0i}}{1 - T'_{0i}} &= \left(1 + \frac{1}{\eta}\right) \frac{\gamma_0}{\theta_i \left(\frac{\hat{f}(\theta_i)}{\Delta}\right) G_i} \\ &\quad \times U_{c0}(\theta) \left\{ \sum_{t=i+1}^N \frac{1 - \lambda_0(\theta_t)}{U_{c0}(\theta_t)} G_t \hat{f}(\theta_t) + \Delta \tau^+(\theta_i) + (\lambda_L - 1) \Delta r^+(\theta_i) \right\}, \\ \frac{T'_{1i}}{1 - T'_{1i}} &= \left(1 + \frac{1}{\eta}\right) \frac{\gamma_1}{\theta_i \left(\frac{\hat{f}(\theta_i)}{\Delta}\right) (1 - G_i)} \\ &\quad \times U_{c1}(\theta) \left\{ \sum_{t=i+1}^N \frac{1 - \lambda_1(\theta_t)}{U_{c1}(\theta_t)} (1 - G_t) \hat{f}(\theta_t) - \Delta \tau^+(\theta_i) - (\lambda_L - 1) \Delta r^+(\theta_i) \right\}, \end{aligned}$$

where  $\Delta \tau^+(\theta_i) = \sum_{t=i+1}^N (t_1(z_1(\theta_t)) - E_1 - t_0(z_0(\theta_t)) + E_0) g_t \hat{f}(\theta_t)$  and  $\Delta r^+(\theta_i) = \left(\frac{r_1}{\varrho_1} - \frac{r_0}{\varrho_0}\right) \sum_{t=i+1}^N g_t \hat{f}(\theta_t)$ .

- ii. The 2 equations associated with the 2 tax-system intercepts are the discrete approximations of the demogrant equations. First, we have the budget constraint:

$$L_0 E_0 + (1 - L_0) E_1 = \sum_{i=1}^N (t_0(z_0(\theta_i)) G_i + t_1(z_1(\theta_i)) (1 - G_i)) \hat{f}(\theta_i) - R,$$

with  $L_0 = \sum_i^N G_i \hat{f}(\theta_i)$  and  $L_1 = 1 - L_0$ . Second, we have the optimality condition on the difference in demogrant:

$$L_0 L_1 \sum_{i=1}^N \left( \frac{1}{L_1} (\lambda_1(\theta_i) - 1) \frac{1}{U_{c1}(\theta_i)} (1 - G_i) - \frac{1}{L_0} (\lambda_0(\theta_i) - 1) \frac{1}{U_{c0}(\theta_i)} G_i \right) \hat{f}(\theta_i) \\ + (\lambda_L - 1) \Delta r^+(\theta) + \Delta \tau^+(\theta) = 0.$$

- iii. The 2 equations associated with the 2 rent levels are the housing market clearing conditions in each location, characterized by  $L_j = \underline{H}_j r_j^{\theta_j}$ , for  $j \in \{0, 1\}$ .

### C.3 Simulation inputs

**Size and housing supply elasticities of Elsewhere and Distressed** We use the 2016-2020 American Community Surveys (ACS) to establish sizes of Elsewhere and Distressed under current taxes. We do this by mapping EZs to 2010 Census tracts following a crosswalk provided to us by Patrick Kennedy, which we further crosswalk to 2020 Census tracts using data from [Chetty et al. \(2020\)](https://opportunityinsights.org/data/) (accessed at <https://opportunityinsights.org/data/>). We then merge tract-level data from the 2020 ACS 5-Year estimates (covering 2016-2020) on population (table DP05), which was accessed at [data.census.gov](https://data.census.gov). To calculate the population share in Distressed, we sum the total population of all EZs tracts (either urban EZs or rural EZs, depending on the Distressed definition) and divide it by the total population.

The housing supply elasticities are computed using the tract-level housing supply elasticities of [Baum-Snow and Han \(2024\)](https://sites.google.com/site/baumsnow/research). The estimates were accessed at <https://sites.google.com/site/baumsnow/research> in October 2022. We use the August 2022 vintage of the data. We use Baum-Snow and Han’s preferred estimates, namely, the column “gamma01b.TYPE.FMM”. To aggregate these tract-level elasticities up to the level of Distressed or Elsewhere, we take population-weighted averages.

**Current tax system** All calibrations are performed under an approximation to the current U.S. labor income tax system based on the [Piketty et al. \(2018\)](https://www.dina.gov) distributional national accounts (DINA) public micro files. We use the DINA public micro files for the years 2016-2020, pooled and inflating all dollar values to 2020. Attention is restricted to tax units (singles or couples) where all members are working age (i.e., are between 30 and 55 years old) and the tax unit earns nearly all of their income from labor. The latter restriction is operationalized by keeping only tax units for which wages and salaries (variable `flwag`) represent between 95% and 105% of total fiscal income including capital gains (variable `fiinc`). We define total taxes net of transfers as the sum of federal personal income taxes (`ditaf`), state personal income taxes (`ditas`), sales and excise taxes (`salestax`), and contributions for government social insurance other than pension, UI, and DI (`othercontrib`), minus social assistance benefits in cash (`dicab`) and social transfers in kind (`inkindinc`). Income is defined as personal factor labor income (`flinc`).

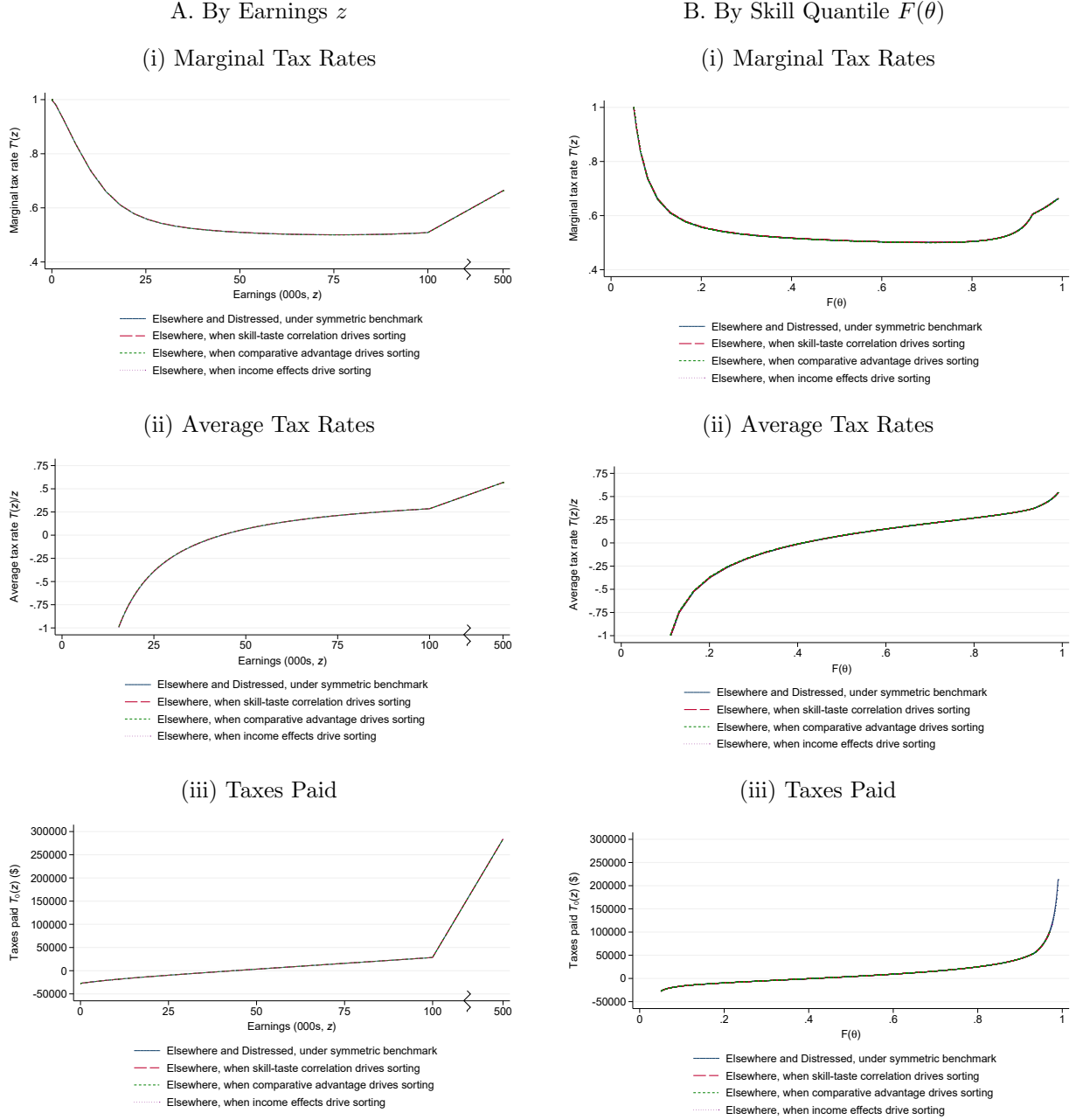
We regress total taxes net of transfers on a spline in income, considering three income brackets defined for annual earnings within  $[\$0, \$20,000]$ ,  $[\$20,000, \$500,000]$ , and  $[\$500,000, \$\infty]$ . To account for the fact that taxes and transfers depend on marital status and the number of children, we control for marital status, a fourth-degree polynomial of the number of children, and the interaction of the two. We estimate empirical marginal tax rates for the three brackets (i.e., coefficients on the spline variables) of 44.6%, 28.1%, and 49.4%, respectively, with a corresponding demogrant (i.e., the coefficient on the constant which corresponds to single childless tax units) of \$11,214. The U-shaped form of the estimated bracket structure is explained by the income phase-out of transfers such as food stamps or Medicaid, and the progressive structure of the income tax system.

Note that since the estimated current tax system has a bracket structure, the individual solution for calibration purposes solves the complete discrete choice problem allowing for bunching at kink points. This adjustment is not needed when solving the optimal tax scheme.

**Exogenous revenue requirement and landlord weight** The exogenous revenue requirement  $R$  is computed as the budget constraint residual in the symmetric benchmark (Section 8.1) calibration under current taxes, resulting in  $R = \$14,746$ . Given that the population is normalized to 1, this value has a per-capita interpretation. We hold this parameter fixed across all simulations.

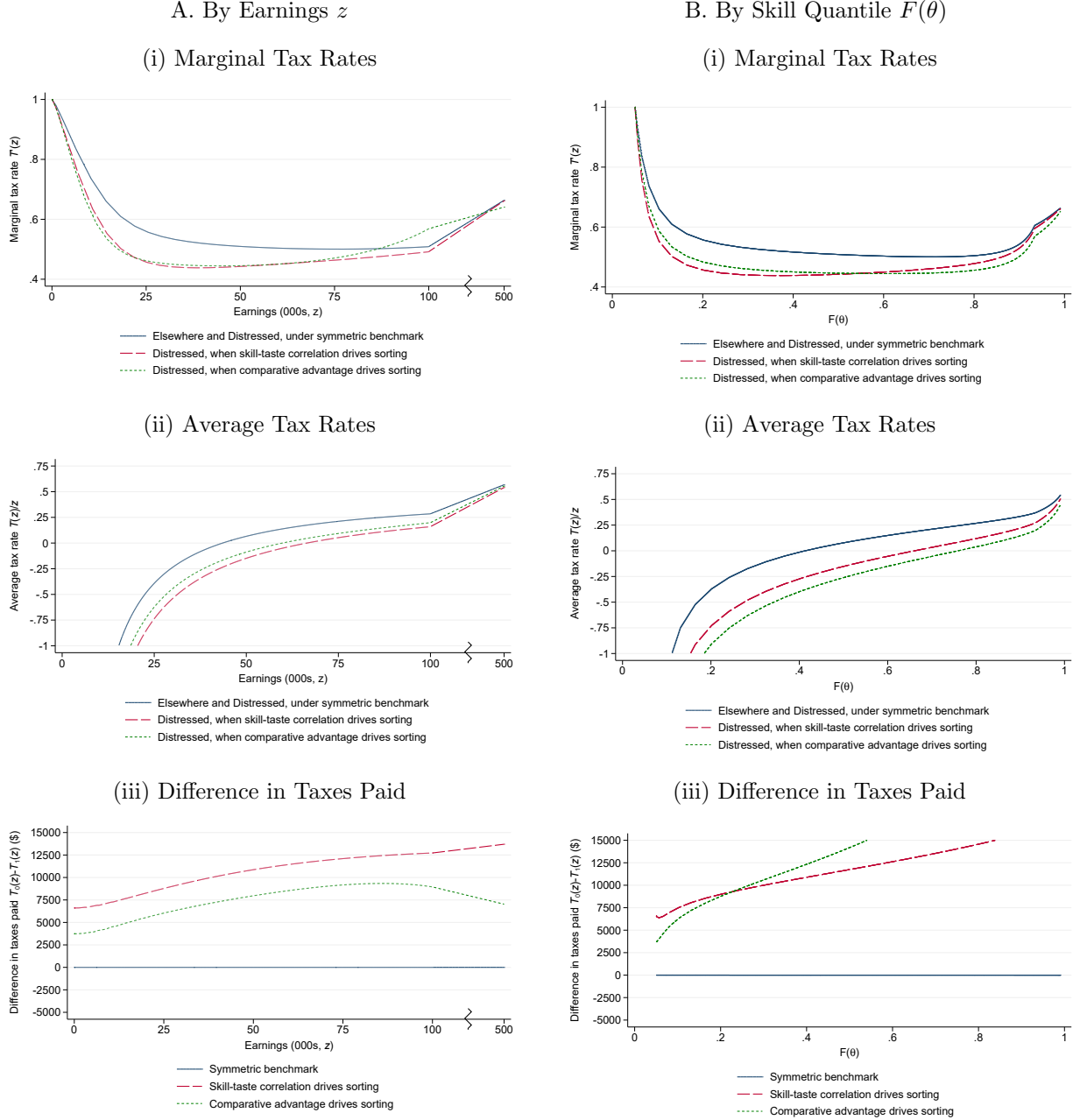
The Pareto weight on landlords  $\omega_L$  equals the equilibrium budget constraint multiplier  $\Gamma$  resulting from the symmetric benchmark equilibrium with optimal taxes, so the planner values landlords similar to the average household in the economy. Specifically, we solve for the optimum under the assumption that  $\lambda_L = 1$ , which implies that  $\omega_L$  equals the value of  $\Gamma$  at the optimum. We obtain  $\omega_L = 0.0205$ . This parameter is held fixed across all simulations except the 75% weight on landlords scenarios of Table 4.

Appendix Figure 1: Optimal Taxes are Similar in Elsewhere under All Scenarios



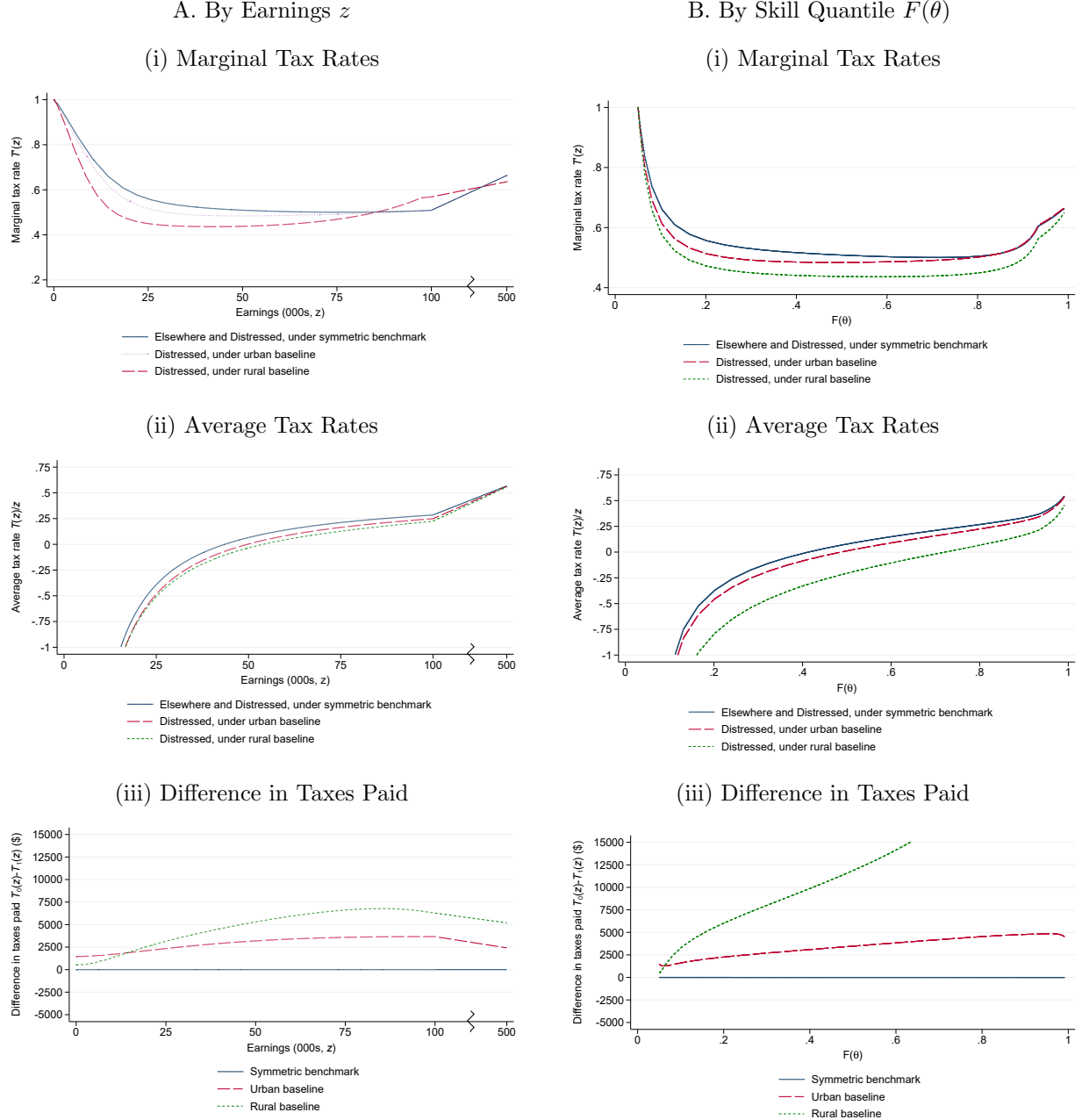
*Notes:* This figure replicates Figure 2 except that it plots Elsewhere tax schedules instead of Distressed tax schedules for the three sorting scenarios in the top four panels and that it shows taxes paid in Elsewhere in the bottom two panels. See the notes to that figure for additional details.

Appendix Figure 2: Optimal Tax Schedules with Less Migration



*Notes:* This figure replicates Figure 2 except that it sets the standard deviation of idiosyncratic preferences for living in Distressed  $\kappa$  is set to 4 instead of 0.5. See the notes to that figure for additional details.

Appendix Figure 3: How Large Might Optimal Place-Based Transfers Be? MTRs and ATRs



*Notes:* This figure plots tax schedules from the symmetric benchmark (reprinted from Figure 2) and from the urban and rural baselines of Table 4. See the notes to those exhibits for details.

Appendix Table 1: Net Within-Earnings Transfers to Distressed Locations Due to Marriage and Children

|                                                        | Within-earnings differences by:         |                  |                   |                                         |                  |                   |                                         |                  |                   |
|--------------------------------------------------------|-----------------------------------------|------------------|-------------------|-----------------------------------------|------------------|-------------------|-----------------------------------------|------------------|-------------------|
|                                                        | Marriage and children                   |                  |                   | Children only                           |                  |                   | Marriage only                           |                  |                   |
|                                                        | Elsewhere<br>minus<br>Distressed<br>(1) | Elsewhere<br>(2) | Distressed<br>(3) | Elsewhere<br>minus<br>Distressed<br>(4) | Elsewhere<br>(5) | Distressed<br>(6) | Elsewhere<br>minus<br>Distressed<br>(7) | Elsewhere<br>(8) | Distressed<br>(9) |
| <i>A. All families</i>                                 |                                         |                  |                   |                                         |                  |                   |                                         |                  |                   |
| <i>i. Distributional National Accounts (DINA) data</i> |                                         |                  |                   |                                         |                  |                   |                                         |                  |                   |
| Taxes                                                  | -623                                    | 34,842           | 35,465            | -68                                     | 34,846           | 34,914            | -513                                    | 34,844           | 35,357            |
| Transfers                                              | 220                                     | 5,848            | 5,628             | -61                                     | 5,846            | 5,907             | 252                                     | 5,902            | 5,651             |
| Net taxes                                              | -842                                    | 28,994           | 29,836            | -7                                      | 29,000           | 29,007            | -765                                    | 28,942           | 29,707            |
| <i>ii. CPS-augmented DINA data</i>                     |                                         |                  |                   |                                         |                  |                   |                                         |                  |                   |
| Taxes                                                  | -623                                    | 34,842           | 35,465            | -68                                     | 34,846           | 34,914            | -513                                    | 34,844           | 35,357            |
| Transfers                                              | 91                                      | 7,005            | 6,913             | -198                                    | 7,004            | 7,202             | 264                                     | 7,045            | 6,780             |
| Net taxes                                              | -714                                    | 27,837           | 28,551            | 130                                     | 27,842           | 27,712            | -777                                    | 27,799           | 28,577            |
| <i>B. Low-earning families only</i>                    |                                         |                  |                   |                                         |                  |                   |                                         |                  |                   |
| <i>i. DINA data</i>                                    |                                         |                  |                   |                                         |                  |                   |                                         |                  |                   |
| Taxes                                                  | -98                                     | 4,102            | 4,200             | -45                                     | 4,103            | 4,148             | -79                                     | 4,112            | 4,191             |
| Transfers                                              | -134                                    | 15,755           | 15,889            | -379                                    | 15,758           | 16,136            | 397                                     | 16,079           | 15,682            |
| Net taxes                                              | 36                                      | -11,653          | -11,689           | 334                                     | -11,654          | -11,988           | -476                                    | -11,967          | -11,490           |
| <i>ii. CPS-augmented DINA data</i>                     |                                         |                  |                   |                                         |                  |                   |                                         |                  |                   |
| Taxes                                                  | -98                                     | 4,102            | 4,200             | -45                                     | 4,103            | 4,148             | -79                                     | 4,112            | 4,191             |
| Transfers                                              | -368                                    | 20,797           | 21,166            | -448                                    | 20,807           | 21,255            | 508                                     | 21,031           | 20,523            |
| Net taxes                                              | 270                                     | -16,695          | -16,966           | 403                                     | -16,704          | -17,107           | -587                                    | -16,919          | -16,332           |

*Notes:* We aggregate the tract-level ACS data to produce counts of families by earnings-x-marriage-x-children cells for “Distressed” (all forty urban and rural EZs pooled) and “Elsewhere” (the rest of the country). We use those counts to produce mean within-earnings net taxes in Distressed and Elsewhere, equal to the community-specific marriage-x-children weighted average of [Piketty et al. \(2018\)](#) distributional national accounts (DINA) data’s net taxes within each earnings cell, integrated over the *nationwide* earnings distribution. The difference between those two weighted averages equals our estimate of implicit place-based transfers. We aggregate the DINA data to the tax unit level. We compute DINA taxes as all taxes gross of refundable tax credits minus social insurance contributions, which equals DINA’s main raw tax variable. We compute DINA transfers as all individualized benefits (e.g., refundable tax credits, medicaid, SNAP) minus social insurance benefits, which equals DINA’s main raw transfers variable minus collective consumption expenditure (e.g., national defense). DINA net taxes equals DINA taxes minus DINA transfers. The CPS-augmented DINA panels use the Current Population Survey to better vary the DINA transfer data by parental status. The low-earners panels restrict attention to families with under \$30,000 in annual earnings. See [A](#) for more details.

Appendix Table 2: Simulation Parameters

|                                                                                                                     | Assumed Parameters       |                                        |                                            |                                                |                                   |                                     |                                         |                                          |                                              | Estimated Parameters                                |                                                      |                 |                              |                                  |                                                 |                                          |                                    |                                    |
|---------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------|--------------------------------------------|------------------------------------------------|-----------------------------------|-------------------------------------|-----------------------------------------|------------------------------------------|----------------------------------------------|-----------------------------------------------------|------------------------------------------------------|-----------------|------------------------------|----------------------------------|-------------------------------------------------|------------------------------------------|------------------------------------|------------------------------------|
|                                                                                                                     | Labor supply elasticity, | Mean of log-normal skill distribution, | Std.dev. of log-normal skill distribution, | Pareto parameter of Pareto skill distribution, | Grid size for skill distribution, | Comparative advantage in Elsewhere, | Housing supply elasticity in Elsewhere, | Housing supply elasticity in Distressed, | Household Pareto weights, $\omega_H(\theta)$ | Elsewhere housing supply shifter, $\underline{H}_0$ | Distressed housing supply shifter, $\underline{H}_1$ | Wage scale, $W$ | Preference shock mean, $\mu$ | Skill-taste correlation, $\beta$ | Comparative advantage in Distressed, $\gamma_1$ | Std. dev. of locational tastes, $\kappa$ | Exogenous revenue requirement, $R$ | Landlord Pareto weight, $\omega_L$ |
|                                                                                                                     | $\eta$                   | $\xi$                                  | $\sigma$                                   | $p$                                            | $N$                               | $\gamma_0$                          | $\varrho_0$                             | $\varrho_1$                              | $\omega_H(\theta)$                           | $\underline{H}_0$                                   | $\underline{H}_1$                                    | $W$             | $\mu$                        | $\beta$                          | $\gamma_1$                                      | $\kappa$                                 | $R$                                | $\omega_L$                         |
| (1)                                                                                                                 | (2)                      | (3)                                    | (4)                                        | (5)                                            | (6)                               | (7)                                 | (8)                                     | (9)                                      | (10)                                         | (11)                                                | (12)                                                 | (13)            | (14)                         | (15)                             | (16)                                            | (17)                                     | (18)                               |                                    |
| <i>A. Scenarios in Table 2</i>                                                                                      |                          |                                        |                                            |                                                |                                   |                                     |                                         |                                          |                                              |                                                     |                                                      |                 |                              |                                  |                                                 |                                          |                                    |                                    |
| <i>i. High migration: Std. dev. of idiosyncratic preferences for living in Distressed <math>\kappa = 0.5</math></i> |                          |                                        |                                            |                                                |                                   |                                     |                                         |                                          |                                              |                                                     |                                                      |                 |                              |                                  |                                                 |                                          |                                    |                                    |
| Skill-taste correlation                                                                                             | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.34                                     | 1.00                                         | 0.50                                                | 0.009                                                | \$3,974         | -1.65                        | 0.85                             | 1.00                                            | 0.50                                     | \$14,756                           | 0.020                              |
| Comparative advantage                                                                                               | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.34                                     | 1.00                                         | 0.50                                                | 0.009                                                | \$3,974         | -1.82                        | 0.00                             | 0.924                                           | 0.50                                     | \$14,756                           | 0.020                              |
| Income-based sorting                                                                                                | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.34                                     | 1.00                                         | 0.50                                                | 0.021                                                | \$3,974         | -2.29                        | 0.00                             | 1.00                                            | 0.50                                     | \$14,756                           | 0.020                              |
| <i>ii. Low migration: Std. dev. of idiosyncratic preferences for living in Distressed <math>\kappa = 4</math></i>   |                          |                                        |                                            |                                                |                                   |                                     |                                         |                                          |                                              |                                                     |                                                      |                 |                              |                                  |                                                 |                                          |                                    |                                    |
| Skill-taste correlation                                                                                             | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.34                                     | 1.00                                         | 0.50                                                | 0.009                                                | \$3,974         | -13.2                        | 6.83                             | 1.00                                            | 4.00                                     | \$14,756                           | 0.020                              |
| Comparative advantage                                                                                               | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.34                                     | 1.00                                         | 0.50                                                | 0.009                                                | \$3,974         | -16.0                        | 0.00                             | 0.906                                           | 4.00                                     | \$14,756                           | 0.020                              |
| <i>B. Scenarios in Table 4</i>                                                                                      |                          |                                        |                                            |                                                |                                   |                                     |                                         |                                          |                                              |                                                     |                                                      |                 |                              |                                  |                                                 |                                          |                                    |                                    |
| <i>i. Urban scenarios</i>                                                                                           |                          |                                        |                                            |                                                |                                   |                                     |                                         |                                          |                                              |                                                     |                                                      |                 |                              |                                  |                                                 |                                          |                                    |                                    |
| Urban baseline                                                                                                      | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.24                                     | 1.00                                         | 0.50                                                | 0.011                                                | \$3,974         | -1.54                        | 0.61                             | 1.00                                            | 0.44                                     | \$14,756                           | 0.020                              |
| 1/2x migration                                                                                                      | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.24                                     | 1.00                                         | 0.50                                                | 0.011                                                | \$3,974         | -5.12                        | 2.48                             | 1.00                                            | 1.52                                     | \$14,756                           | 0.020                              |
| 2x migration                                                                                                        | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.24                                     | 1.00                                         | 0.50                                                | 0.011                                                | \$3,974         | -0.42                        | -0.02                            | 1.00                                            | 0.09                                     | \$14,756                           | 0.020                              |
| No rent differences                                                                                                 | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.24                                     | 1.00                                         | 0.50                                                | 0.011                                                | \$3,974         | -0.98                        | 0.51                             | 1.00                                            | 0.30                                     | \$14,756                           | 0.020                              |
| 1.5x rent differences                                                                                               | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.24                                     | 1.00                                         | 0.50                                                | 0.011                                                | \$3,974         | -1.77                        | 0.64                             | 1.00                                            | 0.49                                     | \$14,756                           | 0.020                              |
| Swap housing elasticities                                                                                           | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.24                                     | 1.00                                         | 0.61                                                | 0.010                                                | \$3,974         | -2.14                        | 0.93                             | 1.00                                            | 0.62                                     | \$14,756                           | 0.020                              |
| 75% weight on landlords                                                                                             | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.24                                     | 1.00                                         | 0.50                                                | 0.011                                                | \$3,974         | -1.54                        | 0.61                             | 1.00                                            | 0.44                                     | \$14,756                           | 0.020                              |
| <i>ii. Rural scenarios</i>                                                                                          |                          |                                        |                                            |                                                |                                   |                                     |                                         |                                          |                                              |                                                     |                                                      |                 |                              |                                  |                                                 |                                          |                                    |                                    |
| Rural baseline                                                                                                      | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.60                                     | 1.00                                         | 0.50                                                | 0.008                                                | \$3,974         | -16.1                        | 0.00                             | 0.900                                           | 4.06                                     | \$14,756                           | 0.020                              |
| 1/2x migration                                                                                                      | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.60                                     | 1.00                                         | 0.50                                                | 0.008                                                | \$3,974         | -33.2                        | 0.00                             | 0.885                                           | 8.23                                     | \$14,756                           | 0.020                              |
| 2x migration                                                                                                        | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.60                                     | 1.00                                         | 0.50                                                | 0.008                                                | \$3,974         | -8.44                        | 0.00                             | 0.900                                           | 1.99                                     | \$14,756                           | 0.020                              |
| No rent differences                                                                                                 | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.60                                     | 1.00                                         | 0.50                                                | 0.005                                                | \$3,974         | -17.3                        | 0.00                             | 0.874                                           | 4.32                                     | \$14,756                           | 0.020                              |
| 1.5x rent differences                                                                                               | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.60                                     | 1.00                                         | 0.50                                                | 0.010                                                | \$3,974         | -16.0                        | 0.00                             | 0.904                                           | 3.95                                     | \$14,756                           | 0.020                              |
| Swap housing elasticities                                                                                           | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.60                                     | 1.00                                         | 0.30                                                | 0.011                                                | \$3,974         | -16.1                        | 0.00                             | 0.900                                           | 3.97                                     | \$14,756                           | 0.020                              |
| 75% weight on landlords                                                                                             | 0.5                      | 2.757                                  | 0.5611                                     | 2                                              | 578                               | 1.00                                | 0.34                                    | 0.60                                     | 1.00                                         | 0.50                                                | 0.008                                                | \$3,974         | -16.1                        | 0.00                             | 0.900                                           | 4.06                                     | \$14,756                           | 0.020                              |

*Notes:* This table reports parameters underlying the simulations whose results are reported in Tables 2 and 4. See the notes to those tables for additional details. The Table 2 scenarios fix  $\kappa$  and only allow one of  $\beta$ ,  $\gamma_1$ , or  $\underline{H}_1$  to vary. The urban scenarios fix  $\gamma_1 = 1$  and the rural scenarios fix  $\beta = 0$ . See the notes to Tables 2 and 4 for additional details.

Appendix Table 3: How Large Might Optimal Place-Based Transfers Be? Manipulating Characteristics of Distressed

|                           | Income-constant<br>average tax<br>differences, $\Delta_z$ | Difference in<br>demogrants, $\Delta_0$ | Std. dev. of<br>idiosyncratic<br>preferences<br>for living in<br>Distressed, $\kappa$ | Skill-taste<br>correlation, $\beta$ | Comparative<br>advantage, $\gamma_1$ |
|---------------------------|-----------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|--------------------------------------|
|                           | (1)                                                       | (2)                                     | (3)                                                                                   | (4)                                 | (5)                                  |
| <i>A. Urban scenarios</i> |                                                           |                                         |                                                                                       |                                     |                                      |
| Urban baseline            | 3,143                                                     | 1,462                                   | 0.44                                                                                  | 0.61                                | 1.000                                |
| Distressed twice as large | 3,128                                                     | 1,452                                   | 0.42                                                                                  | 0.60                                | 1.000                                |
| Distressed half as large  | 3,150                                                     | 1,467                                   | 0.44                                                                                  | 0.62                                | 1.000                                |
| Distressed twice as poor  | 5,787                                                     | 2,649                                   | 0.36                                                                                  | 1.07                                | 1.000                                |
| Distressed half as poor   | 1,520                                                     | 557                                     | 0.48                                                                                  | 0.34                                | 1.000                                |
| <i>B. Rural scenarios</i> |                                                           |                                         |                                                                                       |                                     |                                      |
| Rural baseline            | 4,329                                                     | 532                                     | 4.06                                                                                  | 0.00                                | 0.900                                |
| Distressed twice as large | 3,943                                                     | 142                                     | 3.99                                                                                  | 0.00                                | 0.900                                |
| Distressed half as large  | 3,533                                                     | -347                                    | 4.13                                                                                  | 0.00                                | 0.900                                |
| Distressed twice as poor  | 11,272                                                    | 5,007                                   | 3.69                                                                                  | 0.00                                | 0.796                                |
| Distressed half as poor   | 532                                                       | -1,471                                  | 4.16                                                                                  | 0.00                                | 0.954                                |

*Notes:* This table reports results from additional scenarios that modify the urban and rural baselines of Table 4. The Distressed twice as large and Distressed half as large scenarios target a Distressed population share of 3.4% and 0.85%, respectively, instead of 1.7%. The Distressed twice as poor and Distressed half as poor scenarios target a share of Distressed households earning under \$50,000 that is either double or half of the difference between the Distressed share earning under \$50,000 and the nationwide share of 39%. In the urban scenarios, Distressed twice as poor targets a 73% share of Distressed earning under \$50,000 relative to 56% in the urban baseline, while Distressed half as poor targets 48%. In the rural scenarios, Distressed twice as poor targets an 80% share of Distressed earning under \$50,000 relative to 60% in the rural baseline, while Distressed half as poor targets 49%. See the notes to Table 4 for additional details.