Place-Based Redistribution*

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Abstract

Governments around the world redistribute to distressed areas by conditioning taxes and transfers on location in addition to income. Do the equity gains of place-based redistribution exceed its efficiency costs? Working with a model of locational choice and labor supply decisions that nests workhorse specifications in urban and public economics, we show that when disadvantaged households are spatially concentrated, transfers from one location to another can yield equity gains that outweigh the efficiency costs of distorting location decisions. Efficiency costs dominate equity gains, however, when workers are very mobile or subsidized areas are substantially less productive. We provide expressions for the optimal transfer size that depend on the mobility of households, the earnings responses of movers, and sorting patterns. We also provide conditions under which place-based redistribution can improve welfare when place-blind income taxes are set optimally. Place-based redistribution is more likely to improve on income taxes when society favors spatial equity among households with the same earnings levels, motives for which we provide some utilitarian microfoundations. To gauge the plausibility of such social preferences, we conduct a survey querying Americans about the desirability of place-based redistribution between identically poor households. Responses indicate strong support for targeting tax relief to poor households who live in distressed places. A calibration exercise suggests that place-based transfers that optimally lower the efficiency cost of taxation may be of the same order of magnitude as found in prominent American "zone" policies.

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1 Introduction

Place-based policies tie economic benefits to geographic locations and are prevalent throughout the world (Glaeser and Gottlieb, 2008; Kline and Moretti, 2014b; Ehrlich and Overman, 2020). For example, U.S. Empowerment Zones provide a capped earnings subsidy to eligible full-time workers who live and work in one of forty urban and rural areas. The espoused rationale for such programs is typically redistributive: because poor people are concentrated in certain places, targeting these areas helps disadvantaged households. However, national governments already redistribute to such households through progressive income taxes and income-based transfers like food stamps. Should poor residents of poor places receive an extra transfer based on their location?

Glaeser (2008) articulates the traditional answer of economists that have studied these programs:

> "Help poor people, not poor places"...is something of a mantra for many urban and regional economists... [Place-based] aid is inefficient because it increases economic activity in less productive places and decreases economic activity in more productive places.

In line with this view, most academic research on place-based policies has focused either on their efficiency costs (e.g., Glaeser and Gottlieb, 2008; Albouy, 2009; Fajgelbaum et al., 2018; Gaubert, 2018; Austin et al., 2018) or the potential for such programs to correct market failures by internalizing productivity spillovers or other local externalities (e.g., Kline, 2010; Kline and Moretti, 2014a; Fajgelbaum and Gaubert, 2020; Rossi-Hansberg et al., 2019; Austin et al., 2018; Fu and Gregory, 2019). To date, however, little effort has been devoted to formalizing the redistributive goals that often motivate these policies in the first place.

In this paper, we study conditions under which place-based redistribution (henceforth, PBR) schemes are able to improve on the equity-efficiency tradeoffs posed by "place-blind" transfers implemented through income taxation. At a high level, there are two reasons why PBR might improve on place-blind taxation. First, conditioning transfers on place may lower the efficiency costs of redistributing between households with different levels of pre-tax earnings. Second, PBR may generate welfare gains that income-based redistribution cannot, if society values targeting transfers to residents of distressed areas, even within earnings levels.

We study these two rationales formally through the lens of a spatial equilibrium model. To connect our results to the urban economics literature, we work with a standard discrete choice formulation of household location decisions (McFadden, 1978; Bayer et al., 2007; Busso et al., 2013; Kline and Moretti, 2014b; Ahlfeldt et al., 2015). Households choose to live in one of two locations: *Distressed* or *Elsewhere*, the latter of which may have better amenities, greater labor productivity (i.e., higher wages), and a higher cost of living. Households differ in their skill and in their tastes for the Distressed location. Each household chooses where to live, how much housing to consume, and how much to earn given the national tax system and locational characteristics.

A utilitarian planner designs policy instruments to maximize a weighted average of household indirect utilities. As in classic optimal tax problems (e.g., Mirrlees, 1971), household types are private information but the planner observes each household's earnings level and choice of location.[1] The planner redistributes across earnings levels using a conventional place-blind income tax schedule and can also implement a PBR scheme whereby a lump-sum tax is levied on residents of Elsewhere and rebated to residents of Distressed. When poor households sort to Distressed, transferring a dollar from the average Elsewhere resident to the average Distressed resident will tend to raise welfare. However, spatial targeting yields efficiency costs by inducing Elsewhere residents to move to Distressed, which can entail a reduction in earnings and thereby tax revenue.

Our first result explains how the planner resolves the equity-efficiency tradeoff presented by PBR under a fixed (potentially sub-optimal) tax system. At an optimum, the equity gains of the place-based subsidy equal its corresponding efficiency costs. The optimal subsidy to Distressed grows large when less skilled households are concentrated in Distressed, when few households are indifferent between the two locations, when productivity differences across areas are small, or when the marginal utility of consumption declines slowly with income. The formula provides a foundation for future empirical research on the optimality of place-based transfers by highlighting the earnings effects associated with migration responses as a "sufficient statistic" – in the sense described by Chetty (2009) and Kleven (2020) – for the efficiency costs of place-based policies.

An important question left unanswered by this formula is whether PBR can improve on an optimal income tax system. Classic results in public economics establish conditions under which redistribution via differential commodity taxation – such as taxes on expensive watches and subsidies on cigarettes – can improve welfare over and above redistribution via optimal non-linear income taxes and transfers(Atkinson and Stiglitz, 1976; Saez, 2002). The prototypical result in this literature is that differential commodity taxation will tend to be

[1]Our perspective therefore differs from Albouy (2012) and Fajgelbaum and Gaubert (2020), who derive optimal spatial transfers when the types of all households are observed by the planner.

superfluous whenever heterogeneity in consumption bundles across earnings groups is entirely attributable to the causal effect of earnings. In this polar case, commodity taxes distort labor supply as much as income taxes, while also distorting consumption choices, thereby generating excess efficiency costs.

Our modeling environment differs from the traditional commodity taxation problem in several respects. First, locational choice may directly affect the wage faced by households, as productivity varies across space. Second, location choice affects the price of other goods in the consumption basket, specifically housing, the rental price of which covaries strongly with productivity. Third, while commodity taxes are typically constrained to be linear to prevent tax avoidance via resale, place-based taxes can be nonlinear, as place of residence is a discrete choice that is typically straightforward for governments to verify (Moretti and Wilson, 2019). Finally, there are good reasons to believe that poor households locate in poor places for reasons other than that they are poor. Indeed, modern empirical models of locational choice typically attribute the segregation of income groups to preference heterogeneity (Bayer et al., 2007), mobility costs (Kennan and Walker, 2011; Bayer et al., 2016; Fu and Gregory, 2019), comparative advantage (Dahl, 2002; Baum-Snow and Pavan, 2011) or combinations of these factors (Bayer et al., 2014; Diamond, 2016), possibilities that are encompassed by our framework.

To determine whether PBR improves on optimally chosen income taxes in this modeling environment, we compare PBR to the income tax reform that yields the same equity gains across pre-tax earnings levels as a small lump-sum transfer to Distressed. The income tax reform can induce some households to move and can also affect the labor supply of households that do not change location. We show that the efficiency costs of redistributing across earnings levels via income taxation can exceed those generated by PBR. Furthermore, even when the income tax reform entails lower efficiency costs than PBR, the optimal transfer to Distressed may still be positive if the planner has a motive to transfer from residents of Elsewhere to residents of Distressed who have the same earnings. In this case, PBR is desirable because it yields unique equity benefits that income-based tools cannot achieve.

Building on the latter argument, we discuss several reasons why a planner might favor spatial redistribution among households with identical earnings. One is that a dollar spent on residents of Distressed goes further due to the lower cost of living there, an idea we show can be formalized with standard preference specifications. A second motive for within-income group redistribution arises when amenities and consumption are q-substitutes, in which case the residents of Distressed will tend to exhibit higher marginal utilities of consumption than residents of Elsewhere with the same earnings. For example, disamenities like crime and pollution can raise the marginal utility of consumption goods that help families avoid crime or treat asthma. Finally, place-based policies are sometimes motivated on non-utilitarian grounds, such as to redress past injustices, concerns which can be formalized with generalized social welfare weights (Saez and Stantcheva, 2016).

Whether PBR in fact yields unique equity benefits depends ultimately on the nature of social preferences regarding spatial redistribution. To advance the measurement of such preferences, we conducted a survey on Amazon's Mechanical Turk platform. The survey asks respondents to choose between three equally costly policies offering tax credits to poor households: a transfer to all poor households, a transfer targeted to poor households living in "distressed" areas, and a transfer targeted to poor households living in "thriving" areas. Remarkably, we find that about half the respondents support targeting tax relief to poor households in distressed locations. When asked why they prefer this option, the modal response is that poor households in distressed areas are substantially "worse off" than poor households in thriving locations. Our findings suggest social motives exist not only for redistribution across earnings levels, but also within earnings levels across space.

We conclude our analysis with a detailed quantitative calibration, investigating the potential magnitude and direction of optimal place based transfers. To avoid stacking the deck in favor of PBR, we consider a conventional utilitarian planning problem exhibiting no motives for spatial redistribution within household earnings levels. Hence, our analysis effectively studies the potential of PBR to reduce the efficiency costs of redistributing across earnings levels. Household preferences are chosen to exhibit isoelastic labor supply, additively separable valuations of locational amenities, and extreme value taste shocks. We calibrate the model to match Census data on rents and income distributions across groups of US census tracts classified according to their poverty rates. Spatial productivity differences are calibrated according to the estimates of Hornbeck and Moretti (2019).

Using the calibrated model, we solve numerically for the optimal place-blind income tax as well as the optimal lump-sum transfer to residents of the poorest 1% of US Census tracts. We find that the optimal revenue-neutral transfer to these tracts is approximately $5,400 per resident when the optimal place-blind income tax system is implemented. The optimal place-based transfer falls somewhat, but remains substantial, when the wage-migration elasticity is quadrupled, when productivity differences are doubled, or when the planner is constrained to finance the place-based transfer through increases in the top tax rate only. We further find that when, as in U.S. Empowerment Zones, the transfer is restricted to take the form of a capped subsidy to earnings, the optimal subsidy rate is 36%, which is nearly as large as the 40% subsidy rate of the Earned Income Tax Credit.

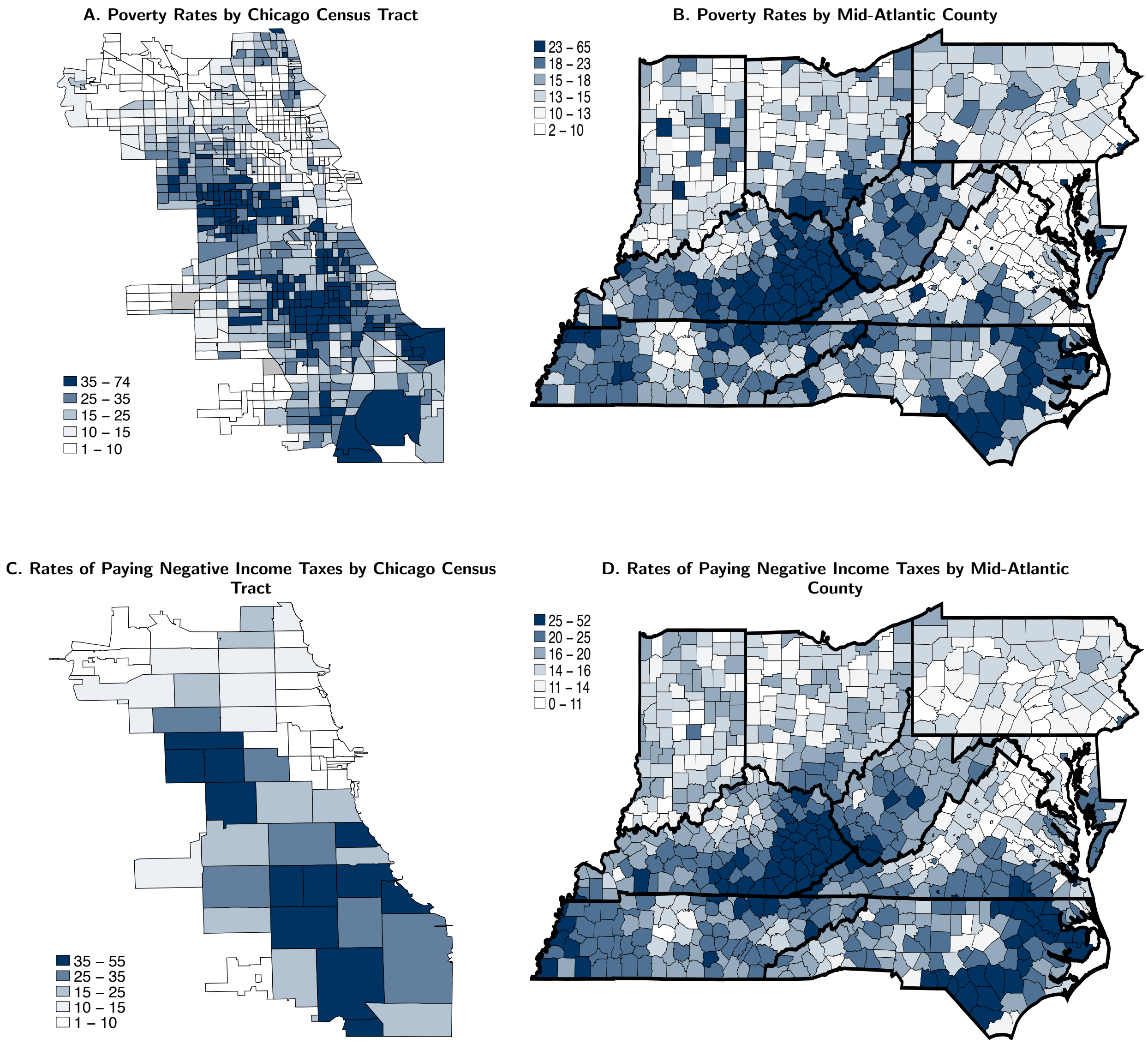
While our calibration results are only suggestive, they concur strongly with the theoretical message of our paper that PBR may serve as a useful complement to place-blind taxation when income groups are geographically segregated by easing the efficiency costs of redistributing across household earnings levels. The benefits of PBR are arguably even greater if, as our survey suggests, society also favors spatial redistribution within earnings levels. The urban economist's mantra warrants revision: there is good reason to consider helping poor people *and* poor places.

2 Motivating Facts

To set the stage for a theoretical analysis, we begin by briefly highlighting some simple stylized facts regarding the uneven spatial distribution of economic outcomes in the United States. The key motivation underlying place-based redistribution is that disadvantage is spatially concentrated. Consider U.S. Census tracts, which are spatially contiguous land areas with typically between 2,500 and 8,000 people. A number of prominent place-based policies have been defined in terms of Census tracts including Empowerment Zones and most recently Opportunity Zones. The increasing tendency of poor households to cluster into particular Census tracts has been extensively documented (Jargowsky, 1997; Reardon and Bischoff, 2011; Reardon et al., 2018). For example, according to pooled estimates from the 2013-2017 waves of the American Community Survey, Census tracts in the top centile of poverty rates have an average poverty rate of 65%, despite a national poverty rate over this period of only 15%.

Figure 1a illustrates the spatial concentration of poverty in Chicago, Illinois – America's third largest city. Darker areas indicate higher poverty tracts in the 2013-2017 ACS. Tracts on the West Side and on the South Side have poverty rates exceeding 50%, while tracts in and around the Gold Coast neighborhood in the northeast of the city have near-zero poverty rates. Chicago's Empowerment Zone comprises a contiguous section of the West Side and a separate contiguous section of the South Side. Clearly, place-based redistribution from the Gold Coast to the West and South Sides has the potential to yield equity gains.

FIGURE 1: Poverty Is Spatially Concentrated



Notes: Panels A and B use the 2013-2017 American Community Survey to plot the share of households below the poverty line, for each Census tract in the city of Chicago and for each county in the Mid-Atlantic region. Panels C and D use 2016 Internal Revenue Service ZIP-level aggregates to plot the share of tax filers receiving a net transfer from the federal income tax due to the refundable Earned Income Tax Credit, for each Chicago ZIP code and for Mid-Atlantic county.

Similar patterns are present at the regional level. Figure 2b shows county level poverty rates in Mid-Atlantic states. Poverty is heavily clustered in the rural Appalachian Mountain area of Eastern Kentucky, with rates comparable to those found in Chicago's West and South Sides. Three of those heavily impoverished counties compose the Kentucky Highlands Empowerment Zone, which provides transfers to residents of these areas.

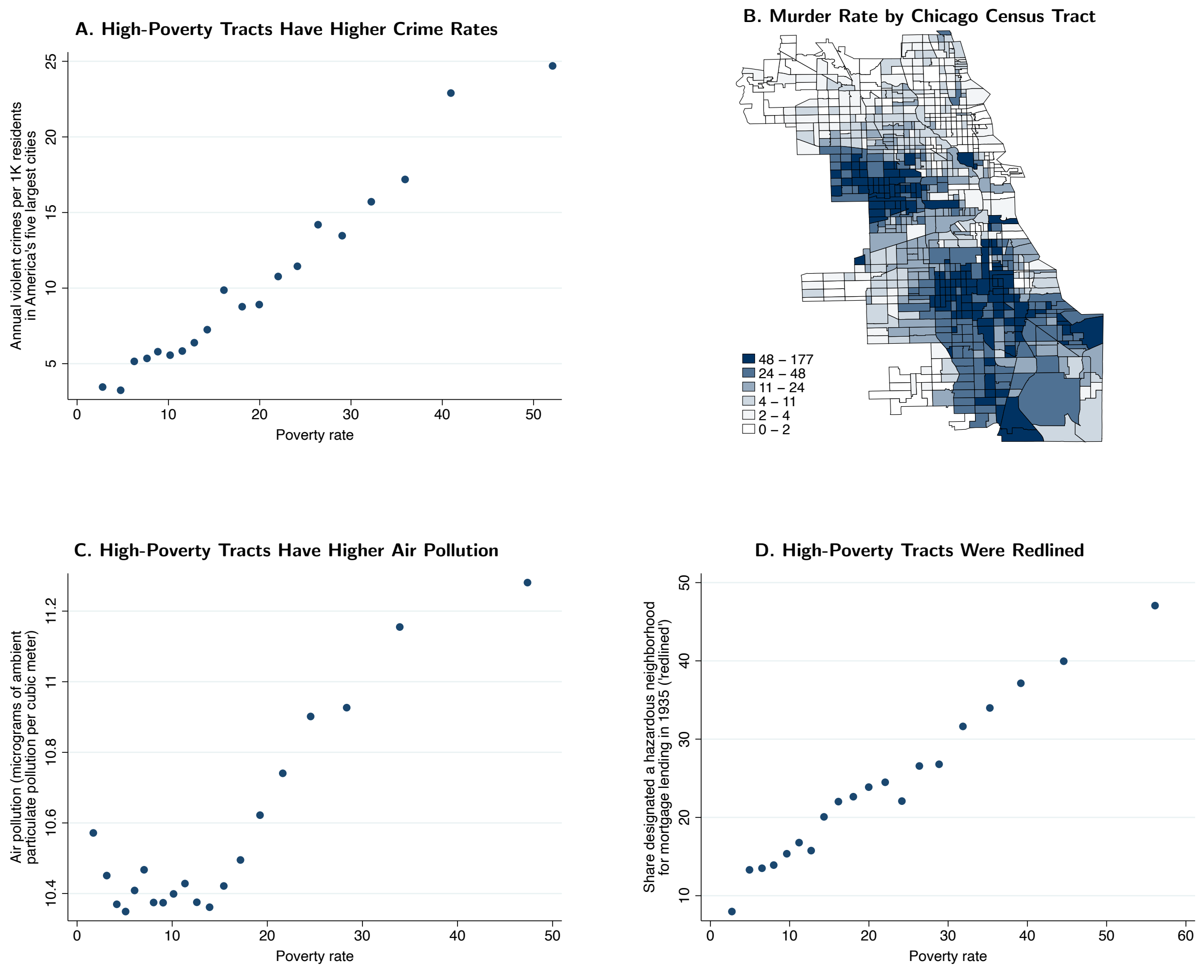
Of course, place-blind transfers based on household income also redistribute to residents of poor areas. Figure 1c uses a ZIP-code map of Chicago to plot the share of tax filing units paying negative federal income taxes due to the Earned Income Tax Credit. Half of tax filers in parts of the West and South Sides have negative income tax bills. Similar rates of negative filing are present in the Appalachian region, as shown in Figure 1d. Whether or not place-based transfers can usefuly complement these equivalent place-blind transfers hinges on their relative efficiency costs, as we examine in detail in the next section.

While both place-based and income-based redistribution can generate equity gains across earnings groups, place-based redistribution may additionally yield spatial equity gains. To the extent that society values redistribution from households in low-poverty areas to households with the same earnings levels that reside in high-poverty areas, place-based policies provide a unique targeting advantage over income-based transfers. Motives for within earnings-group redistribution can stem from several sources. One channel is that disamenities in high-poverty areas can raise the marginal utility of consumption of neighborhood residents. Potentially relevant examples include local crime risks affecting the willingness to pay for car rides home and local pollution levels influencing the value of asthma medication.

The next set of figures illustrate that high-poverty areas tend to also be high disamenity areas, suggesting in turn that the marginal utility of consumption may be elevated there. Specifically, Figure 2a uses the precise geographic coordinates of crimes committed in America's five largest cities – New York City, Los Angeles, Chicago, Houston, and Philadelphia – to plot violent crime rates versus tract poverty rate. The figure shows that violent crimes are five times more prevalent per capita in the highest-poverty tracts than in the lowest poverty tracts. Figure 2b further illustrates this fact using a map of murder rates in Chicago. Figure 2c repeats Figure 2a for the outcome of air pollution, as measured from satellite data for the entire United States (Fowlie et al., 2019). The figure shows that high-poverty tracts have substantially elevated air pollution levels relative to low-poverty tracts, a pattern that has persisted for decades (Colmer et al., 2020).

A desire to right place-based wrongs or other identifiable causes of hardship can also raise the marginal

FIGURE 2: High-Poverty Areas Have Disamenities and Histories of Discrimination



Notes: Panel A uses publicly released lattitudes and longitudes of every crime committeed in America's five largest cities – New York City (2006-2019), Los Angeles (2012-2016), Chicago (2001-2019), Houston (2011, 2013, 2015, and 2018), and Philadelphia (2006-2019) – and tract populations from the 2013-2017 American Community Survey to plot annual violent crimes per 1,000 residents in ventiles of tracts ranked by 2013-2017 ACS poverty rate. Panel B uses the Chicago data from Panel A to plot annual murders per 100,000 residents. Panel C uses satellite data on ambient air pollution (Fowlie et al. 2019) to plot mean pollution by ventile of tracts ranked by 2013-2017 ACS poverty rate. Panel D plots the share of tracts in 239 American cities that were redlined by ventile of tracts ranked by 2013-2017 ACS poverty rate. We define a tract as having been redlined if and only if over half of its land area was labeled as "hazardous" (and therefore colored in red) for mortgage risk in the 1935 Home Owners' Loan Corporation maps digitized by Nelson et al.'s (2020); see the text for more detail.

social value of redistribution to high-poverty areas. A prominent example is redlining: the now-prohibited practice of using borrower race or neighborhood racial composition in mortgage lending decisions.[2] Concern over the legacy of redlining served as the impetus for a host of local and federal efforts to increase investment in predominantly minority neighborhoods (Ross and Tootell, 2004; Squires, 2011). Figure 2d plots the share of tracts in the 239 cities in which at least half of the tract's land area was redlined by the 1935 Home Owner's Loan Corporation, using digitized maps from Nelson et al. (2020). Despite the prohibition of redlining by the 1968 Fair Housing Act, today's high-poverty tracts are ten times as likely to have been redlined in the 1930s as today's low-poverty tracts.

3 A Model of Place-Based Redistribution

In this section, we characterize the fundamental equity-efficiency trade-off faced by place-based redistribution. Redistributing to places where lower income households are segregated enhances equity. The cost of PBR comes from migration responses to the policy, as spatial subsidies lead some households move to areas where they are less productive. Optimal PBR schemes balance the equity advantages of redistributing between areas with the efficiency costs of doing so.

To connect with traditional results on income taxation, we model PBR schemes as transferring income directly to households. In practice, some place-based policies also channel spatial transfers through capital or wage subsidies to businesses (Slattery and Zidar, 2020) or through federal transfers to local governments (Oates, 1999). To the extent that the incidence of such policies falls on households, the guiding principles we derive here will tend to hold. For instance, we demonstrate in the simulations of Section 6 that subsidizing locations with wage credits for businesses can yield analogous improvements to the equity-efficiency frontier. An additional goal of business tax incentives can be to correct market imperfections, for example by exploiting agglomeration economies (Kline and Moretti, 2014a; Fajgelbaum and Gaubert, 2020; Bartik, 2020); likewise, grants to local governments can be designed to correct fiscal externalities (Flatters et al., 1974; Albouy, 2012). We leave to future work the task of integrating Pigouvian corrections and redistributive motives into a common theoretical framework.

[2]The name derives from 239 city maps commissioned in 1935 by the federally sponsored Home Owners' Loan Corporation. The maps used red shading to delineate areas deemed "hazardous" for mortgage lending, often with explicit reference to the racial makeup of the neighborhood (Jackson, 1987). Recent research suggests residents of predominantly Black and Hispanic neighborhoods continue to face related forms of statistical discrimination in the setting of property taxes (Avenancio-León and Howard, 2019).

3.1 Preliminaries

Household preferences We consider an economy where a unit mass of households, who may differ in their skill level, choose to live in one of two communities, 1 ("Distressed") or 0 ("Elsewhere"). Households are characterized by a three-dimensional type $\Theta = (\theta, \varepsilon_0, \varepsilon_1)$. The parameter θ indexes the household's skill, while $(\varepsilon_0, \varepsilon_1)$ are idiosyncratic preference (or cost) shocks for living in location $j \in \{0,1\}$. These types are distributed according to a continuous three-dimensional cdf $F : \mathbb{R}^3 \to [0,1]$.

Households have preferences over the consumption of a homogeneous traded good c and local housing h, over the level of amenities a of their community of residence, as well as over labor supply ℓ. Their preferences are captured by a concave utility function U, with $U_c > 0, U_h > 0, U_a > 0$, and $U_\ell < 0$. The price of the traded good is common in both locations and taken as the numeraire. Locations may differ in three ways: their level of amenities a_j, their rental cost of housing r_j, and their productivity, as reflected in local wage rates. Specifically, each location j has a wage schedule $w_j : \mathbb{R} \to \mathbb{R}_+$ that is an increasing function of household skill. A household of type Θ that resides in location j must therefore supply $\ell = \frac{z}{w_j(\theta)}$ units of labor to generate pre-tax earnings z. This formulation allows for some skill levels to possess a comparative advantage in producing in a given location.

We impose the restriction that each household's preference shock ε_j for living in location j impacts their utility additively, so that the utility of a household of type Θ living in location j can be written:[3]

$$u_j(\Theta) = U\left(c, h, a_j, \frac{z}{w_j(\theta)}\right) + \varepsilon_j. \tag{1}$$

Households choose where to live by maximizing (1) subject to the following budget constraint:

$$c + r_j h = z - T_j(z),$$

where $T_j(z)$ is the tax schedule, which may depend on place and income. Consequently, the indirect utility for a type Θ household of residing in location j is

$$v_j(\Theta) = \max_{z,h} U\left(z - T_j(z) - r_j h, h, a_j, \frac{z}{w_j(\theta)}\right) + \varepsilon_j.$$

Realized indirect utility is therefore $v(\Theta) = \max\{v_1(\Theta), v_0(\Theta)\}$.

[3] We discuss more general formulations in the Appendix, including non-additive preference shocks, as well as shocks on city-specific wage rates, and show how our results extend to these cases.

Household behavior Let the symbol $j^*(\Theta) = \arg\max\{v_1(\Theta), v_0(\Theta)\}$ denote the choice of location made by a household of type Θ. For every choice variable $x \in \{c, h, z, v\}$ we use $x_j^*(\Theta)$ to denote the value of x that would be chosen by a household of type Θ if forced to reside in location j, while $x^*(\Theta) = j^*(\Theta)\, x_1^*(\Theta) + [1 - j^*(\Theta)]\, x_0^*(\Theta)$ gives the value of x actually chosen by such a household. To economize on integral notation, we introduce the expectations operator $\mathbb{E}[x^*(\cdot)] = \int x^*(\Theta)\, dF(\Theta)$. The corresponding conditional expectations operator is defined as:

$$\mathbb{E}[x^*(\cdot)\,|y^*(\cdot) = y] = \frac{\int_{\Theta: y^*(\Theta)=y} x^*(\Theta)\, dF(\Theta)}{\int_{\Theta: y^*(\Theta)=y} dF(\Theta)}.$$

In what follows, we suppress the $(\cdot)$ notation when it is unambiguous to do so.

A key feature of our setup is that locational choice may exert a causal effect on household earnings. A type-Θ household's optimal earnings in Distressed $z_1^*(\Theta)$ may differ from its optimal earnings level in Elsewhere $z_0^*(\Theta)$ for three reasons. First, the household's wage $w_j(\theta)$ may vary across locations. Second, the household's marginal utility of leisure is potentially shaped by the quality of local amenities (a_j), which may differ across locations. High quality amenities and entertainment options may encourage more leisure time; on the other hand, low amenity locations may depress hours of work if they lead to poor health, for instance. A third reason why earnings may differ across places for the same household is through income effects on labor supply: higher cost of living locations should induce longer working hours, all else equal.

The empirical literature has established that earnings do adjust when workers move between cities (Glaeser and Mare, 2001; Baum-Snow and Pavan, 2011; Dauth et al., 2018). A typical finding is that earnings fall when moving to smaller, less dense, metropolitan areas, which suggests employing assumptions that generate $z_1^h < z_0^h$. When thinking about place-based redistribution between neighborhoods of a given city, however, it might be reasonable to instead invoke primitives that yield $z_1^h = z_0^h$. To fix ideas, we frame the discussion below focusing on the case where $z_1^h \leq z_0^h$ for all households, but the formulas we derive apply more generally.

Planner's preferences A planner evaluates allocations subject to the welfare function:

$$SWF = \int \omega(\Theta)\, v^*(\Theta)\; dF(\Theta) = \mathbb{E}[\omega v^*], \tag{2}$$

where $\omega(\Theta)$ gives the Pareto weight assigned to a household of type Θ. These weights capture any additional preference for redistribution across types Θ the planner may have beyond that driven by concavity in utility. The planner can redistribute using two instruments: a place-blind income tax schedule $T : \mathbb{R}_{\geq 0} \to \mathbb{R}$, as well as a place-based transfer indexed by Δ. Letting S denote the share of households who live in Distressed under a place-blind tax regime, we consider a very simple PBR scheme in which the $1 - S$ households in Elsewhere face a lump-sum tax $\frac{\Delta}{1-S}$ while the S households in Distressed receive a lump sum subsidy $\frac{\Delta}{S}$. The place-based tax faced by a household of type Θ is:

$$\frac{S - j^*(\Theta, \Delta)}{S(1-S)}\Delta, \tag{3}$$

where we have indexed the function j^* by Δ in order to highlight the potential influence of the PBR scheme on location choices. Overall, the tax schedule is therefore $T_j(z) = T(z) + \frac{S-j}{S(1-S)}\Delta$. Formally, the planner faces the budget constraint:

$$\mathbb{E}\left[T(z^*) + \Delta\frac{S - j^*}{S(1-S)}\right] = R,$$

where R is an exogeneous revenue requirement faced by the government. The amount $\mathbb{E}[T(z^*)]$ is the net fiscal revenue of the place-blind income tax, while $\mathbb{E}\left[\Delta\frac{S-j^*}{S(1-S)}\right]$ is the net fiscal revenue generated by the PBR scheme.

Letting ϕ denote the Lagrange multiplier on the government budget constraint, transfering a dollar to a household of type Θ leads to a welfare gain of $\omega(\Theta)\frac{\partial v^*(\Theta)}{\partial I}$ (where I is unearned income) at a cost of ϕ. We define:

$$\lambda^*(\Theta) \equiv \frac{\omega(\Theta)\frac{\partial v^*(\Theta)}{\partial I}}{\phi} \tag{4}$$

as the social marginal welfare weight assigned to a household of type Θ by the planner at the initial equilibrium we are considering. This weight measures the dollar value (in terms of public funds) of increasing the consumption of a type Θ household by \$1. Note that the social marginal welfare weight λ is, in general, a function of the whole vector of household characteristics Θ, not just household skill θ. Even when the Pareto weights ω only depend on θ, locational preferences may shape marginal utility of income because location choice impacts earnings choice, cost of living, and amenities.

3.2 Welfare consequences of place-based redistribution

Consider an economy with a place-blind income tax $T(\cdot)$. Can adding a place-based redistribution scheme to this place-blind restribution system improve welfare in this economy? To answer this question, we study the desirability of the simple PBR scheme defined in (3) and compute the welfare effect of an infinitesimal place-dependent tax reform of this nature. Despite its simplicity, this case is rich enough to highlight the key tradeoffs that characterize place-based redistribution. Of course, if redistribution that takes this simple form is desirable, then further efficiency gains can be achieved by fully indexing the income tax schedule to place. To simplify exposition, we make from now on the assumption that the optimal earnings function z^* exhibits no income effects (i.e., that $\frac{dz^*}{dI} = 0$), as this complication yields few insights in itself. The case of income effects on labor supply is fully covered in the Appendix.

We decompose the total welfare effect of the tax reform into two effects: a direct impact on welfare $\frac{dW}{d\Delta}$ and the corresponding fiscal cost of the reform attributable to behavioral household responses $\frac{dB}{d\Delta}$. Because the tax reform we consider is ex-ante budget neutral, we can write $\frac{dSWF}{d\Delta} = \frac{dW}{d\Delta} + \frac{dB}{d\Delta}$.

Welfare impact Implementing the PBR reform (3) generates a net transfer of utility from residents of Elsewhere to those of Distressed, measured by:

$$\frac{dW}{d\Delta} = \mathbb{E}\left[\lambda^*\left(\frac{j^*}{S} - \frac{1-j^*}{1-S}\right)\right] = \bar{\lambda}_1 - \bar{\lambda}_0, \tag{5}$$

where $\bar{\lambda}_j = \mathbb{E}\left[\lambda^* | j^* = j\right]$ is the average social marginal welfare weight of households located in community j. The expression in (5) is the *equity gain* from the transfer. PBR generates an equity gain so long as the average social marginal welfare weight of Distressed inhabitants is higher than that of residents of Elsewhere. When the weights depend only on pre-tax earnings, a sufficient condition for $\bar{\lambda}_1 > \bar{\lambda}_0$ is that the earnings distribution in Elsewhere first-order stochastically dominates that of Distressed (Atkinson, 1970).

Two caveats are in order here. First, we have assumed so far that rents are not affected by the reform. Endogenizing rents would strengthen the case for PBR if housing supply in Elsewhere is less elastic than in Distressed. On the other hand, some of the equity gains associated with PBR could be capitalized into rents if Distressed has strongly inelastic housing supply. These channels are explored more rigorously in the Appendix. Second, we do not account here for any localized externalities that PBR may exacerbate or help internalize. Fajgelbaum and Gaubert (2020) find that it is optimal to subsidize low wage areas and tax high wage areas that are too congested – in which case the equity and efficiency motives for PBR arguably go in the same direction. Integrating equity considerations in a comprehensive framework with local externalities is left for future research.

Efficiency cost The equity gain of a PBR reform must be weighed against its corresponding efficiency loss, as this tax reform comes at a fiscal cost. Although the tax reform is *ex ante* budget neutral, there are two types of behavioral responses to the PBR reform that may generate fiscal externalities. First, some households change their location. These moves do not, per se, generate a first order fiscal externality when starting from a place-blind economy ($\Delta = 0$). However, workers who move may change their earnings, which does generate a first order fiscal effect. Second, households who do not move may adjust their labor earnings in response to the tax reform. Since PBR taxes are lump-sum from the perspective of households who do not move, this second effect is ruled out by our maintained assumption that labor supply fails to exhibit income effects.

To compute the impact of movers on social welfare, we define the share of households with skill-level θ who live in Distressed when the transfer is of size Δ as:

$$S(\theta, \Delta) = \frac{\int_{(\varepsilon_0, \varepsilon_1) \in \mathbb{R}^2} j^* (\theta, \varepsilon_0, \varepsilon_1, \Delta)\, dF(\theta, \varepsilon_0, \varepsilon_1)}{\int_{(\varepsilon_0, \varepsilon_1) \in \mathbb{R}^2} dF(\theta, \varepsilon_0, \varepsilon_1)}. \tag{6}$$

At each skill level θ, the number of movers to Distressed, $\frac{dS(\theta,0)}{d\Delta} \geq 0$, depends on the density of households initially indifferent between the two locations, and therefore on the distribution of their idiosyncratic shocks. However, since preference shocks are additively separable, movers to Distressed change earnings in a way that depends only on their skill θ, not on locational preference heterogeneity – i.e., $z_j^*(\Theta) = z_j^*(\theta)$.[4] Hence, the overall fiscal cost of movers is:

$$\frac{dB}{d\Delta} = \mathbb{E}\left\{ \frac{dS(\cdot, 0)}{d\Delta} \left[T(z_1^*) - T(z_0^*) \right] \right\}. \tag{7}$$

The fiscal cost of movers depends on the density of movers in response to the tax change $\left(\mathbb{E}\left[\frac{dS(\cdot,0)}{d\Delta}\right] \geq 0\right)$, which may vary by skill level, and on the tax revenue losses of each mover $(T(z_1^*) - T(z_0^*) < 0)$, which are driven by either the productivity gap or difference in labor supply behavior between the two locations.

[4] We consider in the Appendix the more general case where preference shocks are not additively separable. Results analogous to the ones we derive here are shown to hold at the expense of substantially more cumbersome notation.

Equity-Efficiency Tradeoff The following result summarizes the equity-efficiency tradeoff in place-based redistribution:[5]

Lemma. *The first order effect on welfare of a small PBR reform starting from a place-blind system is:*

$$\frac{dSWF}{d\Delta} = \bar{\lambda}_1 - \bar{\lambda}_0 + \mathbb{E}\left\{\frac{dS(\cdot,0)}{d\Delta}\left[T\left(z_1^*\right) - T\left(z_0^*\right)\right]\right\}. \tag{8}$$

It is clear from this expression that PBR to a location where disadvantaged households sort is unambiguously welfare improving when the last term is zero rather than negative. This condition is verified in three specific cases: first, if there are no marginal households indifferent between locations, we have $\frac{dS(\theta,0)}{d\Delta} = 0$; second, if earnings do not differ across locations for households, then $T\left(z_1^*\right) - T\left(z_0^*\right) = 0$; third, if movers are a selected sample of households for whom there is no earnings differences across locations then $\frac{dS(\theta,0)}{d\Delta}\left[T\left(z_1^*\right) - T\left(z_0^*\right)\right] = 0$. Hence, PBR is more likely to be beneficial when mobility responses are low, productivity differences between locations are limited, or mobility responses are dominated by households for which earnings differences across space are small. To illustrate these ideas, we briefly discuss three stylized examples encompassed by our modeling framework that capture situations in which PBR fails to generate any fiscal costs.

Example 1 (Neighborhood Zones)**.** Many place-based policies subsidize particular neighborhoods. Consider a city in which workers live in one of two residential neighborhoods (Elsewhere or Distressed). All households work in the same business district, to which they may commute from either residential neighborhood at equal time cost τ. In this model, so long as amenities and housing prices have no independent effect on labor supply, location of residence does not impact job productivity or earnings.[6] In this case, a within-city PBR scheme that subsidizes Distressed entails no fiscal cost: movers who change neighborhoods in response to the subsidy do not lose productivity or adjust their earnings.

Example 2 (Mobility costs)**.** Mobility costs are an important determinant of household migration decisions (Sjaastad, 1962; Kennan and Walker, 2010, 2011; Bayer et al., 2016) that can lead to a dampening of the efficiency costs of PBR. To illustrate this point, suppose households inelastically demand a single unit of housing and have quasi-linear preferences taking the form $u_j(\Theta) = c + a_j - \frac{1}{\nu+1}\left(\frac{z}{w_j(\theta)}\right)^{\nu+1} + \varepsilon_j$, where

[5] The SWF is expressed here in dollar value.

[6] This invariance of earnings choices to location arises for instance when $U = g\left(c - \frac{1}{\nu+1}\left(\frac{z}{(1-\tau)w(\theta)}\right)^{\nu+1} + \widetilde{u}(h,a)\right)$ for some g weakly concave.

$\varepsilon_j \leq 0$ now captures a pecuniary moving cost rather than an idiosyncratic taste. Each household must pay \$$M$ to locate in a community other than the one in which it is "born," so that either $(\varepsilon_1 = -M, \varepsilon_0 = 0)$ or $(\varepsilon_1 = 0, \varepsilon_0 = -M)$. To fix ideas, assume that $a_0 - r_0 = a_1 - r_1 + 1000$, so that each household is willing to pay \$1,000 to avoid living in Distressed. When $M > 1,000$, every household born in Distressed will stay there, while every household born Elsewhere will strictly prefer to reside in Elsewhere. Hence, a small subsidy to Distressed will yield no migration response and therefore no fiscal cost.

Example 3 (Comparative advantage)**.** The technically demanding jobs at which skilled workers excel are increasingly spatially concentrated (Moretti, 2012; Autor, 2019). Consider a model with two skill levels $\overline{\theta} > \underline{\theta}$ and bounded idiosyncratic taste shocks $(\varepsilon_1, \varepsilon_0)$. Suppose Elsewhere has only low skill jobs while Distressed has high and low skill jobs. We formalize this idea with the following assumption on community wages: $w_0\left(\overline{\theta}\right) > w_0\left(\underline{\theta}\right) = w_1\left(\underline{\theta}\right) = w_1\left(\overline{\theta}\right)$. For sufficiently large values of the ratio $w_0\left(\overline{\theta}\right)/w_0\left(\underline{\theta}\right)$, no type $\bar{\theta}$ households will choose to locate in Distressed. If Distressed is subsidized, only type $\underline{\theta}$ households will migrate in response to the PBR scheme 3. When preferences are such that earnings depend only on wages (see Example 1), this type $\underline{\theta}$ migration entails no earnings losses.[7]

3.3 Optimal PBR

Equation (8) gave conditions under which a place-blind tax system can be improved upon by introducing a small place-based transfer. We now derive some results characterizing the magnitude of an optimal PBR scheme. Starting from an optimal Δ^*, a small place-based reform will have no first order effect on welfare. Relative to the expression in (7), an additional first order fiscal externality arises in this analysis due to starting at an optimal $\Delta^* \neq 0$. Movers from Elsewhere to Distressed generate a fiscal loss per capita of $\frac{\Delta^*}{S(1-S)}$ as they go from being net contributors to becoming net beneficiaries of the PBR scheme. Equating $\frac{dSWF}{d\Delta}(\Delta^*)$ to zero leads to the following formula for the optimal place-based transfer Δ^*.

Proposition 1. *The optimal place-based transfer Δ^* obeys:*

$$\Delta^* = \frac{\bar{\lambda}_1(\Delta^*) - \bar{\lambda}_0(\Delta^*) + \mathbb{E}\left\{\frac{dS(\cdot,\Delta^*)}{d\Delta}\left[T\left(z_1^*\right) - T\left(z_0^*\right)\right]\right\}}{\mathbb{E}\left[\frac{dS(\cdot,\Delta^*)}{d\Delta}\right] / \left[S(\Delta^*)\left(1 - S(\Delta^*)\right)\right]}.$$

The size of optimal transfer increases with how unequal Elsewhere and Distressed are, as measured by

[7] That the earnings losses associated with migration are smaller for lower skilled workers finds some empirical support in the panel estimates of Baum-Snow and Pavan (2011).

the difference $\bar{\lambda}_1(\Delta^*) - \bar{\lambda}_0(\Delta^*)$ in the average social marginal welfare weight of their inhabitants evaluated at the optimal value of the transfer. All else equal, the optimal transfer is larger if the two communities are of roughly similar size, if mobility is low, or if the earnings responses to migration are small.

A limitation of the above formula is that all of the quantities are evaluated at the optimal transfer level Δ^*. A non-recursive representation of the optimal transfer level can be had by linearizing $\frac{dSWF}{d\Delta}(\Delta^*)$ around the point $\Delta^* = 0$. This approximation yields the following expression:

$$\begin{aligned}\frac{dSWF}{d\Delta}(\Delta^*) &\approx \bar{\lambda}_1(0) - \bar{\lambda}_0(0) + \mathbb{E}\left\{\frac{dS(\cdot,0)}{d\Delta}\left[T(z_1^*) - T(z_0^*)\right]\right\} \\ &+ \Delta^*\left\{\frac{d}{d\Delta}\left(\bar{\lambda}_1(0) - \bar{\lambda}_0(0)\right) + \mathbb{E}\left[\frac{d^2S(\cdot,0)}{d\Delta^2}\left(T(z_1^*) - T(z_0^*)\right)\right] - \frac{1}{S(1-S)}\frac{dS}{d\Delta}\right\}.\end{aligned}$$

Relative to (8), starting at a point $\Delta^* \neq 0$ leads to additional distortions that are summarized in the second line of this expression. First, the more households move to Distressed, the lower the remaining equity motive, as captured by $\frac{d}{d\Delta}\left(\bar{\lambda}_1(0) - \bar{\lambda}_0(0)\right)$. Second, the fiscal externality of movers will be convex in the transfer size whenever $\frac{d^2S^{\theta}(.,0)}{d\Delta^2} > 0$, i.e., when mobility accelerates with Δ. Finally, the last term captures the direct fiscal externality of movers, who change from being contributors to being beneficiaries of PBR. Manipulating the above expression further leads to the following non-recursive expression for the optimal PBR scheme.

Corollary 1. *Let* $\Lambda(\Theta) = \frac{\partial\lambda(\Theta)}{\partial I} = \frac{1}{\phi}\omega(\Theta)\frac{\partial^2 v^*(\Theta)}{\partial I^2}$ *and* $\bar{\Lambda}_j = \mathbb{E}\left[\Lambda(\cdot)\,|j^* = j\right]$, *both evaluated at* $\Delta = 0$. *Then the optimal place-based transfer* Δ^* *obeys:*

$$\Delta^* \approx \frac{\bar{\lambda}_1 - \bar{\lambda}_0 + \mathbb{E}\left\{\frac{dS(\cdot,0)}{d\Delta}\left[T(z_1^*) - T(z_0^*)\right]\right\}}{\frac{1}{S(1-S)}\left\{\frac{dS}{d\Delta} - \mathbb{C}\left[\frac{dS(.,0)}{d\Delta}, (1-S)\lambda_1(\cdot,0) + S\lambda_0(\cdot,0)\right]\right\} - \left(\bar{\Lambda}_1(0) + \bar{\Lambda}_0(0)\right) - \mathbb{E}\left\{\frac{d^2S(\cdot,0)}{d\Delta^2}\left[T(z_1^*) - T(z_0^*)\right]\right\}}.$$

where for two optimized variables x^* *and* y^*, $\mathbb{C}(x^*, y^*) \equiv \mathbb{E}\left[x^*(\cdot)\,y^*(\cdot)\right] - \mathbb{E}\left[x^*(\cdot)\right]\mathbb{E}\left[y^*(\cdot)\right]$ *denotes covariance.*

Note that this approximate formula for the optimal transfer differs from the expression in Proposition (1) only in its denominator. The first term in the denominator captures the impact of the transfer on movers. Each additional dollar of the place-based transfer mechanically yields a windfall gain of $\frac{1}{S(1-S)}$ to movers. As discussed above, when $\frac{dS}{d\Delta}$ is large, there are many movers, which raises the fiscal cost of PBR. The quantity $\mathbb{C}\left[\frac{dS(.,0)}{d\Delta}, (1-S)\lambda_1(\cdot,0) + S\lambda_0(\cdot,0)\right]$ captures whether movers have above average marginal utilities of consumption, in which case transfers are more effective at raising the welfare of movers. The second term in the denominator, $-\left(\bar{\Lambda}_1(0) + \bar{\Lambda}_0(0)\right)$, measures the concavity of household utility and must be non-negative. When this term is large, the marginal utility of income is capable of being equalized across locations with small transfers. The final term captures the acceleration of efficiency costs due to migration, as discussed above, which limits the optimal size of the transfer.

4 When can PBR complement an optimal place-blind tax?

We have established conditions under which using place as a "tag" for redistribution can lead to welfare gains. It remains to be shown that these conditions can be satisfied when place-blind taxes are chosen optimally. Indeed, classic results from Atkinson and Stiglitz (1976) reveal that in a wide class of models, a given redistributive objective is more efficiently achieved using an income tax than by taxing commodities. To shed light on this more stringent question, we now study whether expression in (8) can be positive when $T(\cdot)$ has been optimally chosen.

4.1 Place-blind tax reform design

Suppose the planner has implemented an optimal place-blind income tax $T(\cdot)$. We aim to compare the effect of a PBR reform to that of a small reform $\mathring{T} : \mathbb{R}_{\geq 0} \to \mathbb{R}$ of the income tax schedule, where the post-reform schedule is denoted:

$$\tilde{T}(\cdot) = T(\cdot) + q\mathring{T}(\cdot), \tag{9}$$

with $q \ll 1$. The place-blind tax reform is designed in such a way that the corresponding equity gains are easily compared to those of the PBR reform (3). Given that the PBR scheme imposes a net tax proportional to $\frac{S-j^*(\Theta)}{S(1-S)}$ on household Θ, it is natural to define the place-blind tax reform at earnings level z as:

$$\mathring{T}(z) = \mathbb{E}\left[\frac{S-j^*}{S(1-S)}|z^* = z\right].$$

That is, $\mathring{T}(z)$ is defined as the pointwise tax reform that, absent a behavioral response, has exactly the same tax effect on individuals with earnings level z as the PBR scheme (3). In particular, this tax perturbation is ex-ante budget neutral, as is the proposed PBR scheme. Letting

$$\rho(z) \equiv \mathbb{E}[j^*|z^* = z]$$

denote the share of households with earnings level z residing in Distressed, the tax perturbation is simply:

$$\mathring{T}(z) = \frac{S - \rho(z)}{S(1-S)}. \tag{10}$$

We note that in the empirically relevant case where $\rho(\cdot)$ is monotone decreasing with income, there exists an earnings threshold $\underline{z}$ such that the tax perturbation (9) is a subsidy for $z \leq \underline{z}$ and a tax for $z > \underline{z}$.

4.2 Welfare impact

For a small tax perturbation $\mathring{T}(\cdot)$, the direct impact of the reform on household welfare is positive for those households that recieve a subsidy, and negative for households for whom $\mathring{T}(\cdot)$ is a tax. The corresponding impact on the social welfare function is $\frac{dW}{dq} = -\mathbb{E}\left[\lambda^* \frac{S-\rho(z^*)}{S(1-S)}\right]$, which differs slightly from the equity impact of the PBR reform in (5). In terms of equity gains, the PBR scheme compares to the income tax perturbation as follows:

$$\frac{dW}{d\Delta} - \frac{dW}{dq} = \frac{\mathbb{E}\left[\mathbb{C}\left(\lambda^*, j^* | z^*\right)\right]}{S(1-S)}, \tag{11}$$

where $\mathbb{C}(x^*, y^* | z^* = z) = \mathbb{E}[x^* y^* | z^* = z] - \mathbb{E}[x^* | z^* = z]\, \mathbb{E}[y^* | z^* = z]$ denotes the covariance between choices x^* and y^* among households with optimized earnings level z. That is, whether or not a PBR scheme yields additional equity gains relative to an income tax reform hinges on the conditional covariance in (11): PBR yields specific equity gains if households located in Distressed tend to have higher social marginal welfare weights than households *with the same pre-tax earnings* that reside in Elsewhere. The sign of this conditional covariance term depends on the planner's preferences and on how location impacts the marginal utility of income. Because within-income group equity considerations have received little formal attention in the literature on place-based policies, we defer the discussion of microfoundations for such spatial equity motives to the next section.

The PBR scheme and the income tax reform also differ in their efficiency cost, which we now compute. The income tax reform triggers two behavioral responses. First, the change in the tax schedule leads to a change in potential earnings in the two locations, and hence a change in their relative utilities. As a result, some households switch communities, leading to a change in earnings and a corresponding fiscal cost $T(z_1^*) - T(z_0^*)$ for households who move from Elsewhere to Distressed. Second, the change in marginal tax rates generates earnings responses for households who do not change location through a substitution effect. Taken together, we show in the Appendix that the fiscal cost of the income tax reform is:

$$\frac{1}{S(1-S)}\underbrace{\mathbb{E}\left\{T'(z^*)\,\rho'(z^*)\,\frac{Z_{1-\tau}}{1+Z_{1-\tau}T''(z^*)}\right\}}_{\text{substitution effect}}+\underbrace{\mathbb{E}\left\{\frac{dS}{dq}\left[T(z_1^*)-T(z_0^*)\right]\right\}}_{\text{movers response}}, \tag{12}$$

where $Z_{1-\tau}(\Theta)=\frac{\partial z^*(\Theta)}{\partial(1-\tau)}>0$ denotes the compensated labor earnings response to a change in the marginal net of tax rate $1-T'(z^*)$.

The net efficiency cost of the PBR scheme relative to the income tax perturbation is

$$\begin{aligned}\frac{dB}{d\Delta}-\frac{dB}{dq}=\mathbb{E}&\left\{\left(\frac{dS(\cdot,0)}{d\Delta}-\frac{dS(\cdot,0)}{dq}\right)\left[T(z_1^*)-T(z_0^*)\right]\right\}\\&-\mathbb{E}\left\{T'(z^*)\,\frac{\rho'(z^*)}{S(1-S)}\,\frac{Z_{1-\tau}}{1+Z_{1-\tau}T''(z^*)}\right\}\end{aligned} \tag{13}$$

To discuss the sign of (23), we focus on the plausible setting where $\rho'(z)<0$ for all $z\in\mathbb{R}_+$, so that the probability of living in Distressed decreases with earnings.[8] In this case, the last term is unambiguously positive because the income tax reform yields an increase in the marginal tax rate at all earnings levels, which distorts the labor supply of all infra-marginal households. In contrast, the place-based reform only affects the behavior of marginal households indifferent between the two communities. The first term in (23) captures the net cost of any PBR-induced moves relative to the corresponding moves induced by the tax reform. This term is weakly negative: PBR generates more moves from Elsewhere to Distressed than does a corresponding income tax, as PBR acts directly upon the relative attractiveness of the two locations. Because these two terms have opposite signs, the sign of (23) is theoretically ambiguous, implying that whether PBR generates efficiency costs larger or smaller than a corresponding income tax reform depends on the specific structure of household preferences and technology present in the economy.[9]

Combining (11) and (23), the welfare gain from PBR relative to a corresponding income tax reform hinges on the sign of the following expression:

$$\frac{dSWF}{d\Delta}-\frac{dSWF}{dq}=\underbrace{\left(\frac{dW}{d\Delta}-\frac{dW}{dq}\right)}_{\text{equity}}+\underbrace{\left(\frac{dB}{d\Delta}-\frac{dB}{dq}\right)}_{\text{efficiency}}. \tag{14}$$

Place-blind income taxation will be dominated whenever the relative equity benefits of PBR outweigh the

[8] Note that this assumption implies that the distribution of pre-tax earnings in Elsewhere first order stochastically dominates the distribution in Distressed.

[9] If, in addition, there are income effects in labor supply, we show in the Appendix that under the assumptions invoked by Saez (2002) on the distribution of these income effects in labor supply conditional on pre-tax earnings, the PBR scheme and the income tax reforms would have the same impact on stayers. Consequently, adding income effects on labor supply to the analysis yields limited additional insight.

policy's relative efficiency costs.

To develop intuition for the mechanics of how PBR can improve upon an optimal income tax, consider a world where the equity term is zero, so that the planner only values redistribution between households with different pre-tax earning levels. Suppose further that PBR entails no efficiency costs, as in the examples of the previous section. A sufficient condition for PBR to improve upon an optimal income tax in this environment is that there be income-based sorting, which delivers equity gains whenever the marginal utility of consumption is declining. We conclude this section with a very simple illustrative example of this argument.

Example 4 (Sorting based on skill-taste correlation)**.** Suppose households have unit housing consumption and maximize utility $u(c, z, j; \theta) = c - \left(\frac{z}{\theta}\right)^{\nu} + a_j(\theta)$, where $a_1(\theta) = 0$ and $a_0(\theta) > 0$. The higher skilled value the amenities of Elsewhere more, so that $a_0'(\theta) > 0$. Following Kleven et al. (2009), we introduce a preference for redistribution by having the planner maximize $SWF = \mathbb{E}[G(v^*)]$, where $G(\cdot)$ is a concave function. It is straightforward to verify that the optimal earnings choices of a type-θ household are identical in the two locations (i.e., $z_1^*(\theta) = z_0^*(\theta)$). The household's location choice can be written:

$$j^*(\theta) = 1\{a_0(\theta) > p_0 - p_1\},$$

so that skilled workers sort to Elsewhere. PBR generates equity gains $\bar{\lambda}_1 - \bar{\lambda}_0 > 0$ because residents of Elsewhere have both higher earnings and higher utility than those in Distressed. PBR yields no efficiency costs, however, as movers do not change their earnings.

To compute the welfare effect of implementing a small reform of the place-blind income tax that delivers the same equity gain as the PBR scheme above, consider the income tax perturbation $T^*(z) + d\tilde{T}(z)$ where:

$$d\tilde{T}(z) = \begin{cases} -\frac{d\Delta}{S} & \text{if } z \leq \underline{z} \\ \frac{d\Delta}{1-S} & \text{if } z > \underline{z}, \end{cases}$$

where $\underline{z}$ is the earnings threshold above which households choose to reside in Elsewhere. This reform targets exactly the same households as PBR, and, absent behavioral responses of households, imposes the same taxes and subsidies as the PBR scheme. In contrast to PBR, however, this reform generates a behavioral response. Specifically, households with initial income in the range $[\underline{z}, \underline{z} + dz]$ will bunch at earnings level $\underline{z}$ to avoid this tax. By reducing their earnings, they generate a fiscal loss for the government, which we denote $\frac{dB_T}{d\Delta} < 0$. Given that we are considering a reform of the optimal tax system, this reform cannot yield a first order effect on welfare:

$$\bar{\lambda}_1 - \bar{\lambda}_0 + \frac{dB_T}{d\Delta} = 0.$$

Hence, the PBR yields a positive first-order welfare gain $\bar{\lambda}_1 - \bar{\lambda}_0$ even in the presence of optimal income taxes.

5 Spatial Equity Motives

In this section we take as given the efficiency costs of PBR and explore in more depth the factors generating equity gains of PBR over and above those that can be achieved with income taxation. The income tax generates equity gains from redistributing *across* earnings levels. Depending on individual and social preferences, there can also be equity gains from redistributing *within* earnings levels from Elsewhere to Distressed that the income tax cannot achieve.

From (5) the equity gains of PBR can be written as a rescaled covariance:

$$\frac{dSWF}{d\Delta} = \frac{\mathbb{C}\left(\lambda^*, j^*\right)}{S\left(1-S\right)},$$

We can decompose this covariance into a between-earnings and a within-earnings welfare gain as follows

$$\mathbb{C}\left(\lambda^*, j^*\right) = \underbrace{\mathbb{C}\left(\mathbb{E}\left[\lambda^*|z^*\right], \mathbb{E}\left[j^*|z^*\right]\right)}_{\text{between earnings}} + \underbrace{\mathbb{E}\left[\mathbb{C}\left(\lambda^*, j^*|z^*\right)\right]}_{\text{within earnings}}.$$

The between-earnings component has clear implications: it is positive if Distressed has an over-representation of low-income households, as discussed above. But note that it is also the component that can be directly targeted by income-based redistribution, so that in the presence of an optimally designed income tax, the specific equity gains of PBR only rely on the within-earnings term. This within-earnings term makes PBR from Elsewhere to Distressed more desirable if and only if, households residing in Distressed tend to have higher social marginal welfare weights than their peers in Elsewhere with the same pre-tax earnings z^*.

We now discuss rationales that push in this direction. The first emphasizes the role played by cost of living differences in making PBR desirable, while the second highlights the role played by heterogeneous amenities in making PBR desirable. To isolate these equity motives driven by cost of living and amenities differences, we focus on preferences that are separable in leisure. We also assume that preferences over amenities are weakly separable from housing and consumption, as follows:

$$U\left(c,h,a_j,\frac{z}{w(\theta)}\right)=\psi\left(g\left(c,h\right),a_j\right)-e\left(\frac{z}{w(\theta)}\right), \tag{15}$$

where $g=g\left(c,h\right)$ is a homothetic consumption goods index, $\psi(.)$ is a weakly concave aggregator, and $e(.)$ captures disutility of labor.

5.1 A dollar goes further in Distressed

To isolate the role of cost of living differences, we temporarily ignore amenity differences by assuming that $a_0=a_1$. Supposing that the planner values households with equal Pareto weights in (2), the corresponding social marginal welfare weight of a household with earnings level z and location choice j is

$$\lambda_z^j=\frac{1}{\phi}\frac{1}{P_j}\psi'\left(\frac{z}{P_j}\right), \tag{16}$$

where P_j is the cost-of-living index in location j corresponding to $g(\cdot,\cdot)$. By assumption, this price index is higher in Elsewhere than in Distressed ($P_0>P_1$).

We are interested in conditions under which, conditional on income z, the social marginal welfare weight λ_z^j is higher in Distressed. Two opposite effects are at play. The quantity $\frac{1}{\phi P_j}$ is higher in Distressed, capturing the fact that a (nominal) dollar spent by the federal government always goes further in buying consumption in the low-price location. By contrast, among households with the same income, the term $\psi'\left(\frac{z}{P_j}\right)$ tends to be higher in Elsewhere: households are poorer in real terms in the high-price location, a motive for redistribution towards high-price locations. Which effect dominates depends on the concavity of $\psi(\cdot)$. Specifically, $\lambda_z^1>\lambda_z^0$ if and only if the mapping $x\mapsto x\psi'\left(x\right)$ is increasing, i.e., if ψ is not too concave.[10] In this case, the "dollar goes further" argument favors redistribution towards low-cost of living places. Note that in the knife-edge case where the two effects cancel out, social marginal welfare weights are functions of nominal income only.

5.2 Households in Distressed are worse off, conditional on income

Heterogeneous amenities may also play a role in motivating redistribution between housheolds with the same earnings. In general, this effect comes in addition to the cost-of-living effect above. To isolate the role of

[10]For CRRA utility with coefficient of risk aversion γ, $\psi(x)=\frac{x^{1-\gamma}}{1-\gamma}$ and the condition is satisfied so long as $\gamma\leq 1$.

amenities, we assume that Distressed is a low amenity area ($a_1 < a_0$), but ignore cost-of-living differences, i.e. we assume that $P_0 = P_1$.

Since social marginal welfare weights are given by:

$$\lambda = \frac{1}{\phi}\frac{\partial \psi}{\partial g}\frac{\partial g}{\partial z},$$

it is straightforward to see that $\lambda_z^1 > \lambda_z^0$ if and only if $\frac{\partial^2 \psi}{\partial g \partial a} < 0$, i.e. consumption and amenities are *q-substitutes*. With q-substitutability, the low level of amenities in Distressed raises the marginal utility of consumption there, all else equal. The assumption of q-substitutability captures well the notion that consumption disamenities can raise the marginal utility of consumption, such as car rides to escape violence or healthcare needs due to pollution-induced asthma. Standard CES preferences of the form $U(g, a_j) = \frac{1}{1-\gamma}\left(a_j^{\frac{\sigma-1}{\sigma}} + g^{\frac{\sigma-1}{\sigma}}\right)^{(1-\gamma)\frac{\sigma}{\sigma-1}}$, with $\gamma \in \left(\frac{1}{\sigma}, 1\right)$ capture such behavior. Interestingly, empirical models of spatial equilibrium (e.g., Moretti, 2011, 2013; Diamond, 2016; Suárez Serrato and Zidar, 2016) typically restrict preferences to obey a Cobb-Douglas functional form between amenities and consumption, which rules this channel out by imposing $\frac{\partial^2 U}{\partial g \partial a} > 0$.

5.3 Equality and Justice

Thus far, our discussion of spatial equity motives has followed the logic of utilitarianism, whereby policies aim to equalize the marginal utility of consumption across households in order to maximize social welfare. However, place-based policies are sometimes motivated by additional considerations such as concerns over inequality in levels of well-being across space, even if levels do not correspond to marginal utilities.[11] A conceptually distinct (but often empirically overlapping) concern has to do with the righting of perceived wrongs involving unequal treatment of places. For example, the 1992 Los Angeles riots are often cited as a motivation for the passage of the federal legislation authorizing the US Empowerment Zones in 1993 (Liebschutz, 1995; Katz, 2015), perhaps because of a sense that living conditions in distressed urban areas were unacceptably poor or that the residents of these areas had been subjected to unfair treatment by police and other parties. Likewise, Gulf Opportunity Zones (GOZs) were instituted in 2005 for areas devastated by Hurricane Katrina.[12] Finally, as mentioned in Section 2, many poor communities face histories of redlining

[11]Concern over inequality in well-being levels can be accommodated by making the planner value a concave function of indirect utilities as in Kleven et al. (2009) (see also Example 4).

[12]While the GOZs and other post-Katrina initiatives may be viewed as a means of addressing externalities involving rebuilding (Fu and Gregory, 2019), they can also plausibly be viewed as valuing redistribution to families with low levels of utility for reasons outside their control.

and continue to bear the burden of other government-sanctioned practices (Avenancio-León and Howard, 2019) that are widely perceived as unfair.

Formally, the policy implications of a variety of redistributive motives can be explored rigorously in a utilitarian framework by choosing high Pareto weights $\omega(\Theta)$ and thus high social marginal social welfare weights λ^* for households to which concerns pertain, as Saez and Stantcheva (2016) note. This approach has not traditionally been followed by the commodity taxation literature (e.g., Mirrlees, 1971; Saez, 2002), which typically assumes that social welfare weights λ^* depend only on pre-tax earnings, thereby avoiding utilitarian dilemmas where the planner must redistribute to high income households with expensive tastes (Kaplow, 2008). While this stance may be reasonable for many, if not most, consumption goods, it is our impression that place-based policies are often motivated by spatial equality and justice motives. Unfortunately, little systematic evidence exists on such social preferences. Therefore, we now turn to exploring this question empirically.

5.4 Social Preferences

To assess social preferences for distribution within earnings groups across space, we conducted a survey on Amazon's Mechanical Turk (MTurk) online labor market platform. MTurk has increasingly been used by social scientists to conduct surveys that have proven concordant with the General Social Survey and other representative national surveys (Paolacci et al., 2010; Horton et al., 2011; Weinzierl, 2014; Kuziemko et al., 2015; Fisman et al., 2020).

On July 9-10, 2020, we posted requests on MTurk for a cumulative total of 1,100 survey respondents with U.S. billing addresses and positive ratings from at least 90 percent of past requestors.[13] Compensation for our ten-minute survey was \$2, which exceeds the typical MTurk wage. As in Fisman et al. (2020), we find that answers to a GSS question on redistributive preferences broadly conforms to representative survey data. Appendix B provides additional details on the survey.

In order to elicit relative social preferences for distribution within earnings levels across local areas, we asked respondents two main questions about government transfers, in random order and with randomly ordered answer choices. One question elicited within-earnings distributional preferences across neighborhoods with the following vignette:

[13]Thirty respondents had invalid MTurk IDs or failed an attentativeness question, yielding a final analysis sample of 1,070 respondents. We surveyed 1,100 in order to ensure at least 1,000 valid attentive responses.

We have written a survey to try to understand how people think about the economy in relation to where people live. There are no right or wrong answers.

Background:

Think about America's cities and towns, which are divided into neighborhoods.

To keep things simple, let's think of there being only three kinds of neighborhoods.

A few neighborhoods are "**distressed**" and have low housing costs but also high poverty, high crime, high pollution, and struggling schools.

Many other neighborhoods are "**thriving**" and have high housing costs but also low poverty, low crime, low pollution, and great schools.

The remaining neighborhoods have typical housing costs, poverty, pollution, schools, and economies.

Also to keep things simple, let's think of there being only two income levels: rich and poor. Rich families earn $90,000 per year. Poor families earn $30,000 per year.

One percent of poor families live in the many thriving neighborhoods, mostly around rich families.

One percent of poor families live in the few distressed neighborhoods, in concentrated poverty.

The government uses a large tax credit to help poor families everywhere.

Question:

Let's pretend that the government has some extra money for new tax credits. It might target the tax credits based on where people live.

The government is deciding between three equally costly options. **It wants you to choose the option that would do the most good.** Which option would you choose?

(No one will work less or move as a result of your choice.)

– A $1 tax credit for poor families everywhere

– A $100 tax credit for poor families in the distressed neighborhoods

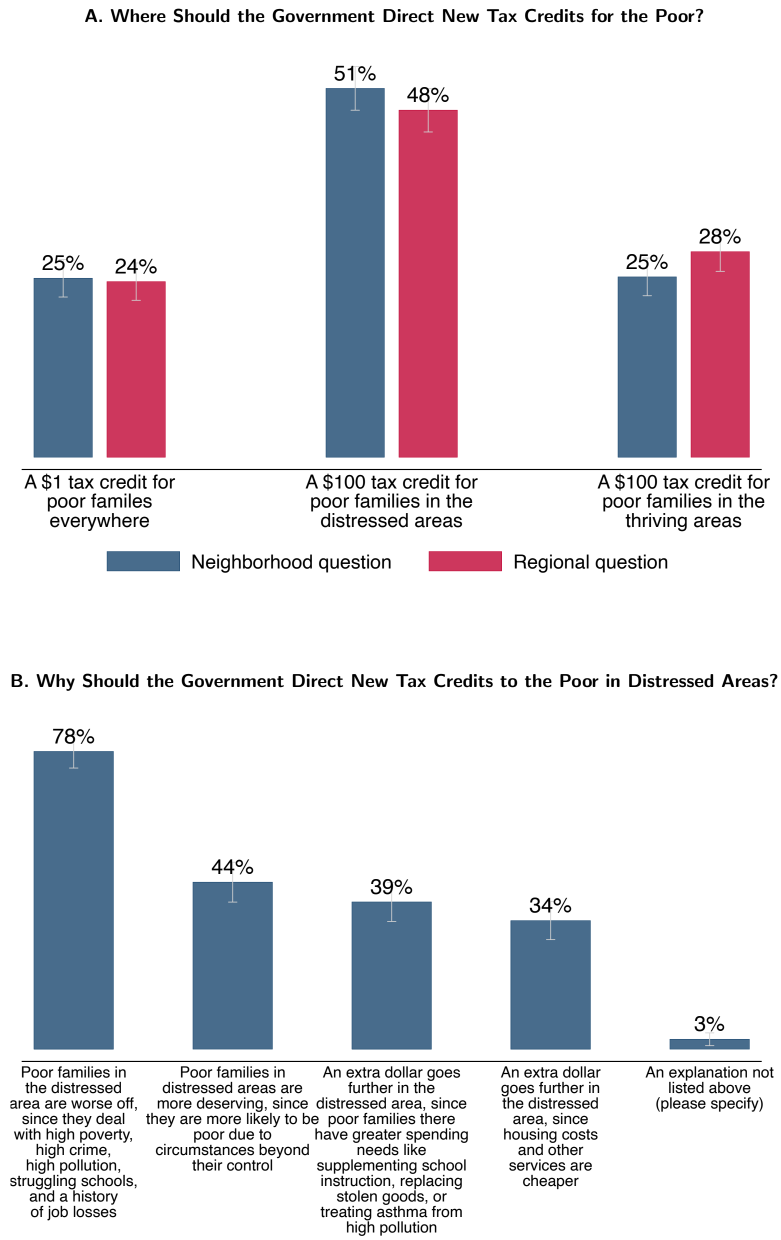
– A $100 tax credit for poor families in the thriving neighborhoods

In telling the respondent that no one will work less or move as a result their choice, we aimed to remove efficiency considerations from their policy choice and therefore home in on social marginal welfare weight considerations.

A second question was identical to the above vignette, except that it elicited within-earnings distributional preferences across regions by replacing the first background sentence with "Think about American regions that are larger than cities but smaller than states." The distressed and thriving regions were described similarly to the distressed and thriving neighborhoods, except that a history of job losses/growth replaced high/low crime.

Figure 3a displays the frequency of each response option. Interestingly, we find that about half of respondents chose to target the benefit to poor families in distressed neighborhoods or regions (51% in the neighborhood question and 48% in the region question). Roughly a quarter of respondents chose to distribute the benefit equally to all poor families, irrespective of where they live (25% and 24%), while the remaining quarter chose to distribute the benefit to poor families in the thriving neighborhoods or regions (25% and 28%). Hence, the survey evidence suggests social preferences that, on average, favor redistribution toward

FIGURE 3: Survey Results on Distributive Preferences



Notes: This figure presents results from our non-representative survey of 1,100 Americans (1,070 valid responses) on Amazon's Mechanical Turk (MTurk) online labor market platform. We told respondents to think of three types of neighborhoods (and separately regions) – "distressed", "thriving", and "typical" – with two types of residents: rich families who earn $90,000 and poor families who earn $30,000. We then asked them to choose the option among three equally costly potential tax credits that would do the most good, under the assumption of no behavioral responses: $1 to every poor family everywhere, $100 to every poor family in the distressed areas, or $100 to every poor family in thriving areas. Panel A plots the results along with 95% confidence intervals. Panel B presents results from a follow-up question to respondents who chose to give $100 to poor families in distressed neighborhoods as well as in distressed regions, which asked them to select all options that explain their choice.

distressed areas within earnings levels.

To understand the motives underlying these responses, we asked each respondent to explain their distributive choices. We focus here on the explanations provided by the respondents who chose to target the benefit to both distressed neighborhoods and distressed regions (Appendix B provides additional results). We prompted those respondents with the following question, the first four options of which were presented in random order:

> In response to the previous questions, you chose a \$100 tax credit for poor families in distressed areas. Which of the following explains your choice? Select all that apply.
> – An extra dollar goes further in distressed areas, since rent and other services are cheaper
> – An extra dollar goes further in distressed areas, since poor families there have greater spending needs like supplementing school instruction, replacing stolen goods, or treating asthma from high pollution
> – Poor families in distressed areas are worse off, since they deal with high poverty, high crime, high pollution, struggling schools, and a history of job losses
> – Poor families in distressed areas are more deserving, since they are more likely to be poor due to circumstances beyond their control
> – None of the above (please specify)

Figure 3b displays the frequency with which each option was selected. A large majority (78%) of respondents choosing within-earnings level redistribution to distressed areas state that they do so because residents there are deprived of basic amenities such as public safety, school quality, and environmental health. The view that poor households living in poor places are especially disadvantaged is notably consistent with a wide array of highly influential qualitative research on poor neighborhoods and regions (Wilson, 1987, 2011; Anderson, 2000; Vance, 2016). That this relative disadvantage is cited as a justification for spatial redistribution is suggestive of an aversion to extreme geographic inequality in certain local amenities.[14] A near majority (44%) of respondents cite the poverty of distressed area residents as being due to circumstances beyond their control, a form of the justice logic of Section 5.3. Slightly fewer (39%) cite a higher marginal utility of consumption due to local disamenities as in the q-substitutes logic of Section 5.2, and 34% cite a higher marginal social value due to lower local prices, as in the dollar-goes-further logic of Section 5.1. Only 3% cite none of the above. In sum, these findings suggest that many Americans favor fostering spatial equity within earnings groups.

[14] Reconciling the normative view that Americans are entitled to certain basic amenities with the fact that many households willingly sort to distressed neighborhoods in order to economize on rent presents a challenge for quantitative spatial equilibrium models. One reason for favoring residents of distressed areas is that they may be "trapped" by a mix of pecuniary and non-pecuniary moving costs (Bergman et al., 2019). These mobility costs may be captured in our framework as described in Example 2 above. Likewise, information frictions (Bergman et al., 2020; Fujiwara et al., 2020) may lead households to make suboptimal location choices. Finally, children and some elderly and disabled individuals are dependent on the neighborhood choices of caregivers, who may not be fully altruistic.

6 How Large Might Optimal Place-Based Transfers Be?

The theoretical analysis of Section 4 revealed that the ability of PBR to improve on income-based taxation relied on a number of behavioral and normative factors. The desirability of PBR is therefore ultimately a quantitative question. In order to gauge what an optimal PBR scheme might look like in the U.S., we turn now to a quantitative calibration of a standard locational choice model and consider a lump-sum place-based transfer to the poorest 1% of local areas, which is roughly the population share of modern U.S. Empowerment Zones.

As discussed above, there are two broad classes of motives for PBR: (i) reducing the efficiency cost of redistributing between households with different pre-tax earnings levels; and (ii) redistributing between households with the same earnings who live in different locations. Although our survey results suggest that (ii) may indeed be aligned with social preferences in the U.S., such motives remain controversial among economists (Davis and Gregory, 2020). To discipline our analysis, we therefore opt in this section to evaluate the desirability of PBR based on (i) alone by considering planning problems with spatially neutral social preferences. To the extent that (ii) is an important additional motive, our results constitute a lower bound on the magnitude of optimal place-based subidies.

6.1 Model parameterization

We work with a standard specification of preferences featuring constant expenditure shares on housing and a traded good, as well as isoelastic labor supply. As in standard discrete choice formulations of locational choice, indirect utility is additively separable in mean local amenities and extreme value dispersion in the valuation of those amenities. Specifically, household preferences take the form:

$$u_j(\Theta) = \ln\left(\left(\frac{c}{1-\alpha}\right)^{1-\alpha}\left(\frac{h}{\alpha}\right)^{\alpha} - \frac{\eta}{1+\eta}\left(\frac{z}{\theta w_j}\right)^{\frac{1+\eta}{\eta}}\right) + a_j(\theta) + \frac{1}{\kappa}\varepsilon_j. \tag{17}$$

In this expression, α is the housing expenditure share, η is the Frisch labor supply elasticity, w_j indexes local wage levels, $a_j(\theta)$ captures the valuation of the amenities of community j by skill type θ, κ is a scale parameter governing the migration elasticity of households to local wages, and ε_j is a Type I Extreme Value (EV1) distributed shock. Furthermore, we parameterizethe distribution of skill types θ as a lognormal distribution with parameters $(\mu_\theta, \sigma_\theta)$.[15] Households maximize utility subject to the budget constraint:

$$c + r_j h = z - T(z) + j\Delta,$$

where r_j denotes community j's local rental cost of housing.

Two comments are in order here. First, we have followed the convention in urban economics of allowing high-skilled and low-skilled households to disagree on the valuation $a_j(\theta)$ of locational amenities (Moretti, 2013; Diamond, 2016). Second, note that when $\eta = 0$, so that labor supply is completely inelastic, this formulation is equivalent (via a log-transformation) to the preference specifications used in workhorse quantitative spatial economics models (Ahlfeldt et al., 2015; Redding and Rossi-Hansberg, 2017).

Households make a discrete choice of where to live and work in one of 100 communities. To take the model to the data, we equate each community with an amalgamation of potentially non-contiguous Census tracts.[16] Specifically, we rank tracts in the 2013-2017 American Community Survey (ACS) by their poverty rate and group tracts into *communities* $j \in \{1, ..., 100\}$ that each have one percent of the U.S. population.

Social preferences are utilitarian (i.e., $SWF = \mathbb{E}[v^*]$) and the planner faces an exogenous revenue requirement R:

$$\mathbb{E}\left[T(z^*) + \Delta \frac{S - j^*}{S(1-S)}\right] = R. \tag{18}$$

The social planner has access to two redistributive tools: a place-blind income tax $T(z)$ and a place-based transfer Δ to a poor community. As a baseline, we consider a transfer that targets the poorest community, which at baseline has 1% of the U.S. population. For computational simplicity, we restrict the place-blind tax system $T(z)$ to be piecewise-linear with kinks at annual earning levels of $\$20,000$ and $\$80,000$ and a lump-sum transfer.

Properties Given this parameterization, the indirect utility of a type worker is $v_j(\Theta) = V_j^\theta + \frac{1}{\kappa}\varepsilon_j$, with

$$V_j^\theta = \ln\left(\left(\frac{\theta w_j\left(1 - T'\left(z_j^\theta\right)\right)}{r_j^\alpha}\right)^{1+\eta} B_j\left(z_j^\theta\right)\right) + a_j(\theta),$$

[15]For numerical purposes below, we discretize the lognormal distribution of skill types with parameters $(\mu_\theta, \sigma_\theta)$ into fifty equal-sized bins, each with two percent of the population.

[16]Empowerment Zones are typically contiguous amalgamations of neighborhoods, such as Chicago's Empowerment Zone which comprises a contiguous West Side amalgamation and a separate South Side amalgamation. Opportunity Zones are based on Census tracts and need not be contiguous.

where $B_j(z) = \left\{ \frac{1-\frac{T(z)-j\Delta}{z}}{1-T'(z)} - \frac{\eta}{1+\eta} \right\}$. Because the difference in EV1 errors is distributed logistic, the share of θ workers living in community j absent any taxes is

$$s_j(\theta) = \frac{\left(\frac{\theta w_j}{r_j^\alpha}\right)^{\kappa(1+\eta)} \exp(\kappa a_j(\theta))}{\sum_{i=1}^{100} \left(\frac{\theta w_i}{r_i^\alpha}\right)^{\kappa(1+\eta)} \exp(\kappa a_i(\theta))}.$$

The parameter κ governs the migration elasticity. Specifically, the elasticity of location shares to wage, holding leisure constant is $\frac{\partial \log s_j(\theta)}{\partial \log w_j} = \kappa(1+\eta)(1-s_j(\theta))$. For a given community with 1% of population, the elasticity is therefore approximately equal to $\kappa(1+\eta)$. With this specification of preferences, in the absence of income taxes, sorting of unobserved skill types across space arises solely due to skill-taste correlation. To see this, note that $s_j(\theta) \propto \exp(\kappa a_j(\theta)) \left(\frac{w_j}{r_j^\alpha}\right)^{\kappa(1+\eta)}$, which only depends on θ through the amenities term. In particular, comparative advantage in production does not play a role, as all skill types benefit proportionally from locating in high-w_j communities.

Finally, our specification of household preferences is easily shown to avoid spatial equity motives within income levels. Specifically, in the absence of income taxes, the planner's welfare weight can be written $\lambda^*(j,\theta) = (1+\eta)/z_j^\theta$. Hence, welfare weights vary across households with different earnings, but not within earnings across space. Our specification thereforeavoids inducing preferences for spatial equity within income groups. This neutrality works against finding a large Δ^*.[17]

6.2 Calibration

To quantify the model, we proceed as follow. We first calibrate some elasticities of the model based on empirical estimates from the literature. We set $\alpha = 0.3$ to match a 30% housing expenditure share (Davis and Ortalo-Magne, 2011) and $\eta = 0.5$ to match a labor supply elasticity of 0.5 (Chetty et al., 2011). The scale parameter κ is set to 1/2 to match the wage-migration elasticities reported in Kennan and Walker (2011). We calibrate the rental rate r_j of each community to that community's population-weighted mean rent in the ACS, adjusted for housing quality differences (number of bedrooms, number of units in the building, and age of building) and normalizing the lowest-poverty (and highest-rent) community's rent r_{100} to one. To calibrate productivity differences between communities, we use the relationship between Metropolitan Statistical Area

[17] Davis and Gregory (2020) consider a planner that only values redistribution between skill θ, but not across space with skill θ. In our setup $\lambda^*(j,\theta) \propto \theta^{-(1+\eta)} r_j^{\alpha\eta - \beta(1+\eta)}$ where β is the productivity-rent gradient. Therefore, when $\beta = \alpha\frac{\eta}{1+\eta}$, the planner only values redistribution between θ levels. We explored a robustness check with this alternative calibration and find an optimal PBR that is slightly smaller but of the same order of magnitude as in our baseline.

rent and productivity in Hornbeck and Moretti (2019) whereby log-productivity rises by 0.254 per log-point of rent. Normalized rent r_j varies from 0.4 in the highest-poverty and lowest-rent community (Distressed) to 1 in the lowest highest rent community, so that productivity ranges from 0.8 in Distressed to 1 in the lowest-poverty community; that is, each skill type's wage is 20% lower in Distressed than it is in the lowest-poverty community.

To calibrate the remaining parameters $\{\mu_\theta, \sigma_\theta, a_j(\theta)\}$, we then use a minimum distance algorithm between moments of the model and equivalent moments in the data. Specifically, these parameters are calibrated in order for the model to exactly match each community's share of each of nine nationwide household earnings bins based on the ACS tract-level aggregates, while minimizing the sum of square deviations from the share of the nationwide population with earnings in the bottom two ACS-based bins (i.e., below \$19,500) and the share with earnings in the top three ACS-based bins (i.e., above \$88,000). The resulting communities each have nearly 1% of the nationwide population, by construction.[18] When solving the model for the purpose of the calibration, we assume, based on Piketty et al. (2018), that the current income tax system is place-blind and involves a \$10,800 lump-sum transfer with effective marginal tax rate brackets of 43.8% up \$20,000, 16.1% up to \$80,000, and 27.1% above \$80,000.[19]

Table 1 summarizes the calibrated parameters. After calibrating the model, we numerically solve for both the optimal place-blind income tax schedule $T^*(z)$ and the optimal PBR transfer Δ^* to the poorest community. We set R in the constraint (18) equal to 10.1% of national income $\mathbb{E}[z^*]$ in order to hold fixed the budget surplus that we find in the calibration using the current tax system, estimated from Piketty et al. (2018). This budget surplus represents the majority of government expenditures that are public goods expenditures like national defense rather than individual benefits like food stamps.

6.3 Optimal policies

We find that social welfare is maximized in our stylized environment when every resident of Distressed (the poorest 1% of Census tracts) receives an extra \$5,400 per year, for example in the form of a refundable tax credit. Figure 4 and Table 2 display the results.

[18] Community populations deviate slightly from 1% because the nine-bin nationwide earnings distribution cannot be matched exactly with the two-parameter lognormal skill distribution.

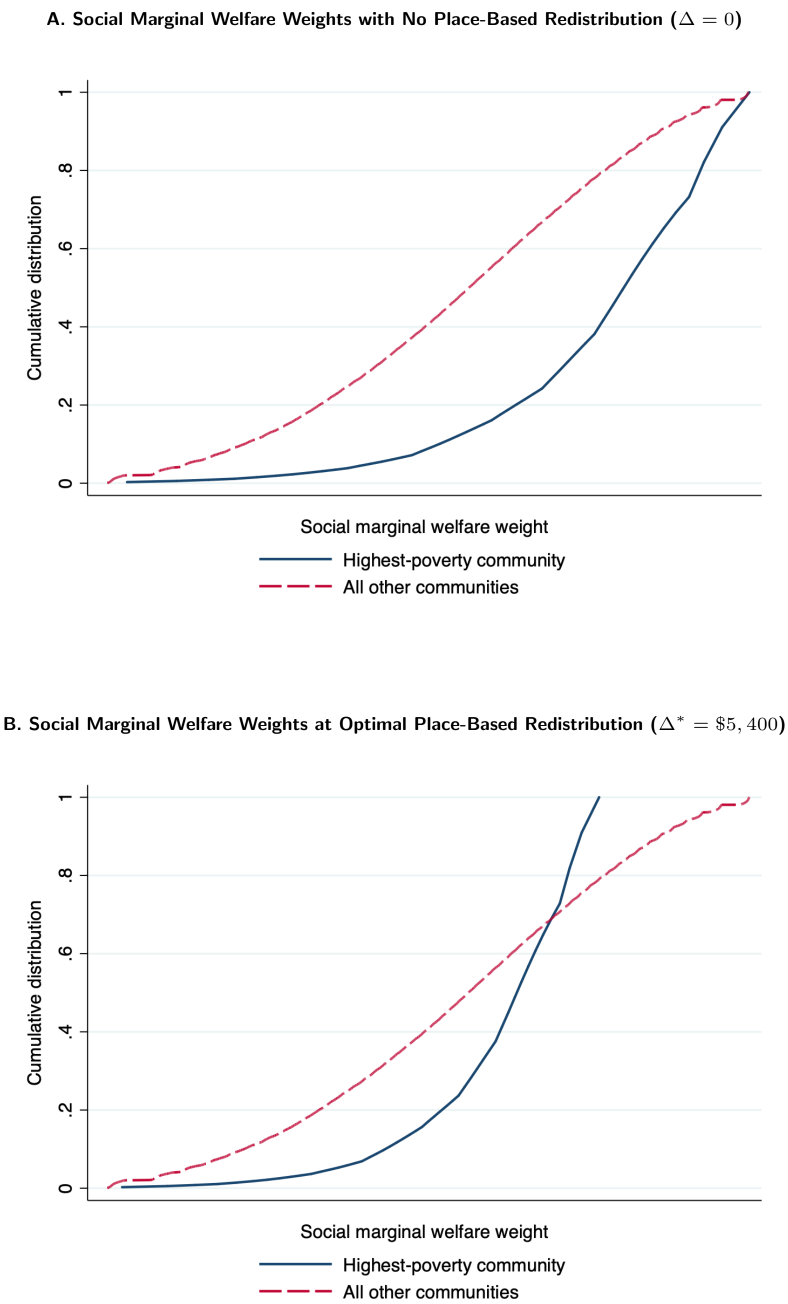
[19] We estimate the tax system on the 2013-2017 sample of prime-age laborers in Piketty et al.'s distributional national accounts. The tax system includes all taxes paid to and individualized transfers received from all levels of government except contributory social insurance taxes and benefits (e.g., Social Security). The lump-sum transfer to zero-earners reflects transfers like food stamps and Medicaid.

TABLE 1
Parameters for the Baseline Calibration

	p1	p25	Median	p75	p99	Sources
	(1)	(2)	(3)	(4)	(5)	(6)
Housing expenditure share (α)			0.3			Davis-Ortalo-Magne (2011)
Labor supply elasticity (η)			0.5			Chetty-Guren-Manoli-Weber (2011)
Migration elasticity wrt wage (κ)			0.5			Kennan-Walker (2011)
Rent (r_j)	0.42	0.53	0.63	0.76	1	2013-2017 American Community Survey
Community productivity (w_j)	0.80	0.85	0.89	0.93	1	Hornbeck-Moretti (2019)
Current place-blind lump-sum transfer ($-T(0)$)			10,900			Piketty-Saez-Zucman (2018)
Current marginal tax rate below $30K			39.1%			Piketty-Saez-Zucman (2018)
Current marginal tax rate $30K-$100K			11.2%			Piketty-Saez-Zucman (2018)
Current marginal tax rate above $100K			34.8%			Piketty-Saez-Zucman (2018)
Mean of the lognormal skill dist. (μ_θ)			2.9			Calibrated to ACS earnings dist.
Std. dev. of the lognormal skill dist. (σ_θ)			0.6			Calibrated to ACS earnings dist.
Community-skill amenity level ($a_j(\theta)$)	-3.07	0.55	1.28	1.61	3.79	Calibrated to ACS tract pop. shares

Notes - This table lists the parameters underlying our baseline numerical exercise and their sources. Our numerical exercise considers 100 communities j, each of which is a collection of tracts grouped into centiles by poverty rate in the 2013-2017 American Community Survey (ACS). The lognormal skill distribution is discretized into 50 skill types (θ). For each community, we group subsets of the 50 skill types into 9 earnings groups, for which the ACS provides tract-level population shares. There are 900 community-skill amenity levels ($a_j(\theta)$), one for each community-earnings group.

FIGURE 4: Place-Based Redistribution Alleviates Poverty in Distressed Areas



Notes: This figure pertains to our quantitative exercise. It plots the distribution of social marginal welfare weights $\lambda^*(\Theta)$ in Distressed (the poorest community) and Elsewhere (the other ninety-nine communities) at zero PBR ($\Delta = 0$) in Panel A and at the optimal PBR ($\Delta = \$5,400$) in Panel B, with the income tax chosen optimally in each case.

TABLE 2
How Large Might Optimal Place-Based Transfers Be?

	Optimal level of PBR	Increase in population of Distressed at the optimum	Pre-PBR value of redistributon from Elsewhere to Distressed	Post-PBR value of redistributon from Elsewhere to Distressed	Social marginal welfare weight difference narrowed	Place-blind lump-sum transfer	Place-blind marginal tax rate above $100K
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Lump-Sum PBR							
Baseline	$5,400	10%	1.32	1.09	71%	$19,580	42.0%
No productivity differences	$5,600	10%	1.31	1.08	74%	$19,694	42.5%
2x productivity differences	$4,750	9%	1.31	1.11	65%	$19,499	41.8%
Very elastic migration ($\kappa = 2$)	$2,500	20%	1.32	1.21	35%	$19,568	41.8%
Change top income tax bracket only	$3,250	6%	1.32	1.17	46%	$19,669	42.9%
Hold current marginal tax rates fixed	$6,750	17%	1.58	1.14	76%	$10,789	34.8%
Use all tax revenue for redistribution	$6,350	10%	1.32	1.09	71%	$22,936	35.6%
B. Capped Earnings Subsidy PBR							
Baseline	36%, $5,400	7%	1.32	1.14	55%	$19,622	42.2%
No productivity differences	38%, $5,700	8%	1.31	1.13	59%	$19,716	42.5%
2x productivity differences	30%, $4,500	6%	1.31	1.16	49%	$19,521	41.8%
Very elastic migration ($\kappa = 2$)	15%, $2,250	13%	1.32	1.24	26%	$19,585	41.8%
Change top income tax bracket only	27%, $4,050	6%	1.32	1.18	43%	$19,669	42.9%
Hold current marginal tax rates fixed	46%, $6,900	13%	1.58	1.23	60%	$10,803	34.8%
Use all tax revenue for redistribution	42%, $6,300	8%	1.32	1.14	56%	$22,963	35.6%

Notes - This table lists results of our numerical exercises of place-based redistribution (PBR) to the poorest simulated community ("Distressed"), which corresponds to the poorest 1% of U.S. Census tracts. Panel A lists results for lump-sum PBR: a flat dollar amount to every Distressed resident. Panel B lists results capped earnings subsidy PBR: a percentage subsidy to Distressed residents for their first $15,000 of earnings. The Baseline rows denotes the calibrated economy based on Table 1's parameters. The other rows correspond to single variations to the baseline calibration. Column 1 lists the PBR level that maximizes social welfare. Column 2 lists the percentage increase in the population of Distressed under the optimal PBR. Column 3 lists the relative value to the planner of distributing an extra dollar to the average resident of Distressed to the average resident elsewhere, when the planner maximizes social welfare using place-blind taxes but not PBR. Column 4 repeats column 3, when the planner maximizes social welfare using both place-blind taxes and PBR. Column 5 lists the share of the no-PBR social value difference between distibuing a dollar to Distressed and distributing a dollar elsewhere that is narrowed by the use of PBR. Column 5 equals one minus [column 4 minus one]/[column 3 minus one]. Columns 6 and 7 list the place-blind lump-sum transfer and the top-bracket income tax rate under the optimal PBR.

Figure 4 plots the distribution of social marginal welfare weights $\lambda^*(\Theta)$ in Distressed (the poorest community) and Elsewhere (the other ninety-nine communities) at zero PBR ($\Delta = 0$) and at the optimal PBR ($\Delta = \$5,400$), with the income tax chosen optimally in each case. Panel A shows that, at zero PBR, social marginal welfare weights in Distressed first-order stochastically dominate those in Elsewhere, as every quantile of Distressed residents is poorer than every quantile of Elsewhere residents. Panel B shows that the optimal level of PBR breaks the first order stochastic dominance of social marginal welfare weights, as it alleviates poverty in Distressed.

The first row of Table 2 displays the full set of results for this baseline quantification. The $5,400 optimal level of Δ is large relative to the place-blind lump-sum transfer at the optimum of $19,580.[20] At $\Delta = 0$, the average social marginal welfare weight in Distressed is 32% higher than the average social marginal welfare weight in Elsewhere. The optimal level of Δ strongly reduces this gap, to 9%. The planner's optimal policy increases population in Distressed by 10%, to approximately 1.1% of the U.S. population.

Sensitivity Analysis The remaining rows of panel A of Table 2 consider alternative parameterizations of our quantitative model, each of which deviates from the baseline parameterization in a single dimension. Recall that our baseline parameterization adopts the Hornbeck and Moretti (2019) productivity-rent gradient, which is estimated using differences across metropolitan areas over time. It is possible that the true productivity-rent gradient is steeper across regions or flatter across neighborhoods. We therefore consider two extreme differences in this productivity gradient. Specifically, the second row of Table 2 assumes that all communities have the same productivity, while the third row allows productivity differences to be twice as high as those estimated by Hornbeck and Moretti. We find that the optimal level of PBR rises to $5,600 under no productivity differences and falls to $4,750 when productivity differences are doubled.

Our baseline parameterization adopts the Kennan and Walker (2011) finding that the elasticity of a state's population with respect to the offered wage is 1/2. To gauge the robustness of our findings to a higher elasticity of region or neighborhood population, we consider a migration elasticity four-times greater elasticity than Kennan and Walker's. The fourth row of Table 2 reports the result. We find that the optimal level of PBR falls to $2,500.

Our baseline parameterization allows the planner to fund PBR through any change in place-blind taxes. Political and other considerations may make it desirable to fund PBR only through raising taxes on high

[20] Mankiw and Weinzierl (2010) similarly find an optimal lump-sum transfer to all Americans of approximately $20,000.

earners. The fifth row of Table 2 therefore constrains the planner to finance the lump-sum place-based subsidy to Distressed by only adjusting the top bracket of the place-blind tax system (which applies to earnings over \$80,000). Doing so lowers the optimal level of place-based subsidy to \$3,250.

The final two rows of panel A of Table 2 consider two additional amendments to the planner's constraints. The sixth row forces the planner to hold marginal tax rates fixed. That is, the planner must compute the optimal budget-neutral PBR scheme under the current place-blind income tax regime, rather than the optimal one. Imposing this constraint raises Δ^* to \$6,750. Unsurprisingly, starting at a suboptimal place-blind income tax leaves a greater role for PBR to improve upon existing redistribution. Finally, the seventh row sets the exogenous revenue requirement R to zero, thereby allowing the planner to use all tax revenue for redistribution. This relaxation of the revenue constraint boosts Δ^* to \$6,350. The intuition for this result is that, when there is no exogenous revenue requirement, any given level of redistribution can be achieved through lower marginal tax rates, so the planner optimally does more redistribution.

A Place-Based Earnings Subsidy As a final exercise, we consider a capped earnings subsidy, rather than a lump-sum transfer, to every resident of Distressed. This policy is meant to mimic the current U.S. Empowerment Zone program, which provides a 20% firm-side earnings subsidy on the first \$15,000 in earnings of zone residents who work at zone firms. The schedule therefore amounts to a \$3,000 subsidy for all eligible workers earning over \$15,000 annually – which is approximately full-time earnings at the federal minimum wage – and a smaller subsidy at lower earnings. Political considerations may make earnings subsidies more attractive than lump sum transfers.

Panel B of Table 2 reports the optimal subsidy rate on each Distressed household's first \$15,000 of earnings under various assumptions. The first row of the Panel reveals that, under our baseline calibration, the optimal subsidy rate is 36%. For households earning over \$15,000, the 36% subsidy rate happens to yield \$5,400 – the same amount as the optimal lump-sum transfer amount reported in Panel A of Table 2. However, the capped earnings subsidy provides less aid to the poorest Distressed households and consequently reduces less of the gap in social marginal welfare weights between Distressed and Elsewhere than the lump-sum transfer. The other rows of Panel B report a sensitivity analysis, which yields findings similar to the corresponding exercises reported in Panel A. In sum, across a wide array of specifications, we find sizable optimal transfer levels that are on the same order of magnitude of real-world place-based policy parameters such as those of

Empowerment Zones.

7 Conclusion

While the literature has focused on studying *efficiency* motives for place-based policies, we study the *equity* rationale for place-based policies. We ask whether it makes sense to index redistribution on place, beyond indexing it on income alone. If tagging on dimensions other than income has traditionally been viewed with skepticism in the public finance literature (Mankiw and Weinzierl, 2010), we note that tagging based on place is highly policy-relevant: unlike height and almost all other potential "tags" (Akerlof, 1978), governments around the world actually condition transfers on place.

We find that place-based redistribution is justified, first, if it lowers the efficiency cost of redistribution. In that sense, PBR will tend to be desirable when spatial transfers induce few moves, when productivity is uniform across space, when labor supply is especially elastic, and when there is strong sorting across place-based on earnings. Second, PBR can be also justified if it provides unique equity gains that income-based redistribution cannot achieve. A survey suggests that social preferences may align with this motive for place-based redistribution.

Ultimately, the desirability of place-based redistribution is a quantitative question that depends on the empirical context. We conduct a quantitative calibration and find that the optimal lump sum transfer for the poorest U.S. census tracts may be sizable, over and above an optimally chosen income-based tax system. While the calibration results are necessarily specific to our modeling of household preferences, they accord closely with the broader theoretical message of our paper that the efficiency costs of place-based policies need to be weighted carefully against the corresponding equity gains of these programs. Household sorting generates tremendous geographic segregation of income groups, which makes location a natural tag. When living in poor areas signals disadvantage over and above one's own income, the case for place-based redistribution as a supplement to progressive income taxation is only strengthened.

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ONLINE APPENDIX

A Theory Appendix

A.1 Proofs and derivation

A.1.1 Derivation of equations 8

Taking into account the budget balance constraint, the Lagrangian for the social planner's problem is:

$$\mathcal{L} = \int \omega(\Theta)\, v^*(\Theta)\; dF(\Theta) - \phi \int T\left(z^*(\Theta)\right)\; dF(\Theta)$$

The total welfare effect of a PBR scheme expressed in terms of the value of public funds is:

$$\mathcal{W}(\Delta) - W(0) = \frac{1}{\phi}\int_{stayers} \omega(\Theta)\left[v^*(\Theta,\Delta) - v^*(\Theta,0)\right]\, dF(\Theta) + \frac{1}{\phi}\int_{movers} \omega(\Theta)\left[v_1(\Theta,\Delta) - v_0(\Theta,0)\right]\, dF(\Theta)$$

where $v(\Theta,\Delta)$ is the indirect utility of household Θ under PBR scheme Δ. As $\Delta \to 0$, the first order effect of the reform on the utility of movers is 0, as movers in response to an infinitesimal PBR are initially indifferent between the two communities. Second, the number of movers is infinitesimal. Denote with $F_{\xi|\theta}(.)$ the cdf of $\xi = \varepsilon_1 - \varepsilon_0$ for households with skill θ, $f_{\xi|\theta}(.)$ the corresponding pdf, and $F_\theta(\theta)$ the marginal distribution of θ, and write $U_j(\theta,\Delta) = U\left(c_j(\theta), h_j(\theta), a_j, \frac{z_j(\theta)}{w_j(\theta)}\right)$. We have:

$$\begin{aligned}
\int_{v_1(\Theta,0)<v_0(\Theta,0),v_1(\Theta,\Delta)>v_0(\Theta,\Delta)} dF(\Theta) &= \int \left[F_{\xi|\theta}\left(U_1(\theta,\Delta) - U_0(\theta,\Delta)\right) - F_{\xi|\theta}\left(U_1(\theta,0) - U_0(\theta,0)\right)\right] dF_\theta(\theta) \\
&\approx \Delta \int f_{\xi|\theta}\left(U_1(\theta,0) - U_0(\theta,0)\right)\left(\frac{dU_1(\theta,0)}{d\Delta} - \frac{dU_0(\theta,0)}{d\Delta}\right) dF_\theta(\theta) \\
&= O(\Delta)
\end{aligned}$$

Therefore, the integration of the stayers term can be done on all households, irrespective of whether they move or not. Taking the appropriate limits, and using the envelope theorem (income is chosen optimally by households) the first order effect of a PBR simplifies to:

$$\begin{aligned}
\frac{dW}{d\Delta} &= \frac{1}{\phi}\int \omega(\Theta)\,\frac{\partial U}{\partial c}\,\frac{j(\Theta) - S}{S(1-S)}\, dF(\Theta) \\
&= \int \lambda(\Theta)\,\frac{j(\Theta) - S}{S(1-S)}\, dF(\Theta) \\
&= \bar{\lambda}_1 - \bar{\lambda}_0.
\end{aligned}$$

We now compute the effect of the PBR on the fiscal revenues, as households move hence change their income as a response to the PBR. Each mover moves necessarily to community 1, which is made relatively more attractive by the PBR scheme. This entails a revenue change per mover $T(z_1(\Theta)) - T(z_0(\Theta)) = T(z_1(\theta)) - T(z_0(\theta))$ so that the change in fiscal revenues due to movers, starting at no PBR, is:

$$B_{T,movers}(\Delta) - B_{T,movers}(0) = \int\int_{v_1(\Theta,0)<v_0(\Theta,0),v_1(\Theta,\Delta)>v_0(\Theta,\Delta)} \left(T(z_1(\Theta)) - T(z_0(\Theta))\right) dF(\Theta)\, dF_{\xi|\theta}(\xi) dF_\theta(\theta)$$

which leads to:

$$\begin{aligned}\frac{dB_{T,movers}(\Delta)}{d\Delta} &= \mathbb{E}\left\{f_{\xi|\theta}\left(V_1(\cdot,0) - V_0(\cdot,0)\right)\left(\frac{1}{S}\frac{\partial U_1}{\partial c} + \frac{1}{1-S}\frac{\partial U_0}{\partial c}\right)\left[T(z_1) - T(z_0)\right]\right\} \\ &= \mathbb{E}\left\{\frac{dS(\cdot,0)}{d\Delta}\left[T(z_1) - T(z_0)\right]\right\}\end{aligned}$$

where $\frac{dS(\theta,0)}{d\Delta}$ is the density of movers at skill θ, starting from 0 PBR.

A.1.2 Derivation of Proposition 1

We compute the first order welfare effect of a PBR reform starting from Δ_0. Derivations are as above, noting that social welfare weights are now evaluated at PBR level Δ_0, that is:

$$\frac{dW}{d\Delta} = \bar{\lambda}_1(\Delta_0) - \bar{\lambda}_0(\Delta_0).$$

The behavioral response has an additional term. We start at a budget neutral PBR scheme of $\frac{S(\Delta_0)-j^*}{S(\Delta_0)(1-S(\Delta_0))}\Delta_0$. Fiscal revenues from PBR are 0, but the fiscal effect of movers on the PBR budget is $-\frac{\Delta_0}{S(\Delta_0)(1-S(\Delta_0))}\frac{dS}{d\Delta}(\Delta_0)$ so that overall the welfare effect of the PBR reform is:

$$\frac{dSWF}{d\Delta}(\Delta_0) = \bar{\lambda}_1(\Delta_0) - \bar{\lambda}_0(\Delta_0) + \mathbb{E}\left\{\frac{dS(\cdot,\Delta_0)}{d\Delta}\left[T(z_1^*) - T(z_0^*)\right]\right\} - \Delta_0\mathbb{E}\left\{\frac{1}{S(\Delta_0)(1-S(\Delta_0))}\frac{dS}{d\Delta}(\cdot,\Delta_0)\right\}.$$

At the optimal PBR scheme Δ^*, $\frac{dSWF}{d\Delta}(\Delta^*) = 0$. Rearranging terms leads to the formula in Proposition 1.

A.1.3 Derivation of Corollary 1

We now derive a first order approximation of this expression around $\Delta_0 = 0$:

$$\begin{aligned}\frac{dSWF}{d\Delta}(\Delta) &= \bar{\lambda}_1(0) - \bar{\lambda}_0(0) + \mathbb{E}\left\{\frac{dS(\cdot,0)}{d\Delta}\left[T(z_1^*) - T(z_0^*)\right]\right\} \\ &+ \Delta\left\{\frac{d}{d\Delta}\bar{\lambda}_1(0) - \frac{d}{d\Delta}\bar{\lambda}_0(0) + \mathbb{E}\left\{\frac{d^2S(\cdot,0)}{d\Delta^2}\left[T(z_1^*) - T(z_0^*)\right]\right\} - \frac{1}{S(1-S)}\mathbb{E}_\theta\left\{\frac{dS(\cdot,0)}{d\Delta}\right\}\right\}\end{aligned}$$

Let $\Lambda(\Theta) = \frac{\partial \lambda(\Theta)}{\partial I} = \frac{1}{\phi}\omega(\Theta)\frac{\partial^2 v^*(\Theta)}{\partial I^2}$ and $\bar{\Lambda}_j = \mathbb{E}[\Lambda(\cdot)|j^*=j]$, evaluated at $\Delta = 0$. We have:

$$\frac{d\bar{\lambda}_1(\Delta)}{d\Delta} - \frac{d\bar{\lambda}_0(\Delta)}{d\Delta} = \bar{\Lambda}_1(0) + \bar{\Lambda}_0(0) + \mathbb{E}\left[\frac{dS(.,0)}{d\Delta}\left(\frac{\lambda_1(\theta,0) - \bar{\lambda}_1(0)}{S} + \frac{\lambda_0(\theta,0) - \bar{\lambda}_0(0)}{1-S}\right)\right]$$

Overall, at the optimal PBR, so long as it small, we have:

$$\Delta^* = \frac{\bar{\lambda}_1(0) - \bar{\lambda}_0(0) + \mathbb{E}\left\{\frac{dS(\cdot,0)}{d\Delta}\left[T(z_1^*) - T(z_0^*)\right]\right\}}{\mathbb{E}\left[\frac{dS(.,0)}{d\Delta}\left(\frac{\bar{\lambda}_1(0)-\lambda_1(\theta,0)}{S} + \frac{\bar{\lambda}_0(0)-\lambda_0(\theta,0)}{1-S}\right)\right] + \mathbb{E}\left\{\frac{d^2S(\cdot,0)}{d\Delta^2}\left[T(z_1^*) - T(z_0^*)\right]\right\} + \frac{1}{S(1-S)}\mathbb{E}\left\{\frac{dS(.,0)}{d\Delta}\right\} - \left(\bar{\Lambda}_0(0) + \bar{\Lambda}_1(0)\right)},$$

A.1.4 Derivation of equations (11), (12) and (23)

We compute the first order effect of the income tax perturbation on the SWF. In this derivation, we assume that preferences can give rise to income effects of labor supply. We make the following technical assumption:

Assumption. *The income tax schedule $T(.)$ is smooth and $T'(z) > 0$.*

The first-order effect of the income tax perturbation on utility, expressed in terms of the value of public funds, is:

$$\begin{aligned}\frac{dW}{dq} &= -\frac{1}{\phi}\int \omega(\Theta)\frac{\partial U}{\partial c}\mathring{T}(z(\Theta))\,dF(\Theta) \\ &= -\int \lambda(\Theta)\mathring{T}(z(\Theta))\,dF(\Theta) \\ &= -\int \lambda(\Theta)\left(\frac{S - \rho(z(\Theta))}{S(1-S)}\right)dF(\Theta)\end{aligned}$$

The behavioral responses to the tax reform are twofold. First, households who do not move get a hit by a simple income tax reform change and adjust their earnings. The corresponding first order loss in tax revenue is:

$$\frac{dB}{dq} = \mathbb{E}\left\{T'(z^*)\frac{dz^*}{dT'(z^*)}\frac{dT'(z^*)}{dq}\right\}.$$

A change in the tax schedule affects earnings z through income and substitution effects. For a given household with skill θ located in city j, we denote by $z_j^\theta(1-\tau, I)$ the earnings they would supply with a linear budget constraint with tax rate τ and virtual income I. An arbitrary small income tax change $\mathring{T}(z)\,dq$ produces a change in earnings:

$$dz^* = -\frac{\partial z^*}{\partial(1-\tau)}d\tau + \frac{\partial z^*}{\partial I}dI.$$

The change in marginal tax rate $d\tau$ is equal to:

$$d\tau = \mathring{T}'(z^*)\, dq + T''(z^*)\, dz^*,$$

where the first term comes from the direct change in the tax rate and the second one comes from the fact that z adjusts and that the initial tax schedule has some curvature, leading to a change in marginal rate when z change. The virtual income shock is :

$$dI - z^* d\tau = -\mathring{T}(z^*)\, dq.$$

Hence:

$$dz_j = \frac{-\left(\frac{\partial z^*}{\partial(1-\tau)} - \frac{\partial z^*}{\partial I} z^*\right)\mathring{T}'(z^*)\, dq - \frac{\partial z^*}{\partial I}\mathring{T}\left(z_j^\theta\right) dq}{1 + \left(\frac{\partial z^*}{\partial(1-\tau)} - \frac{\partial z^*}{\partial I} z^*\right) T''(z^*)}, \tag{19}$$

where the first term in parenthesis is the substitution effect. We now apply this computation to the tax perturbation that mimics a PBR scheme. To do so, we make the following assumption:

Assumption 1. *The function $\rho(z)$ is differentiable in z.*

Under this assumption, we get:

$$\frac{dz^*}{dq} = \frac{1}{S(1-S)} \frac{\left(\frac{\partial z^*}{\partial(1-\tau)} - \frac{\partial z^*}{\partial I} z^*\right)\rho'(z^*) - \frac{\partial z^*}{\partial I}\left(S - \rho(z^*)\right)}{1 + \left(\frac{\partial z^*}{\partial(1-\tau)} - \frac{\partial z^*}{\partial I} z^*\right) T''(z^*)}$$

Denote the substitution effect and income effect as follows:

$$Z_c(\Theta) = \frac{\partial z^*}{\partial(1-\tau)} - \frac{\partial z^*}{\partial I} z^*$$
$$Z_I(\Theta) = \frac{\partial z^*}{\partial I}$$

Then

$$\frac{dz^*}{dq} = \frac{1}{S(1-S)} \frac{Z_c(\Theta)\rho'(z^*) - Z_I(\Theta)\left(S - \rho(z^*)\right)}{1 + Z_c(\Theta) T''(z^*)}$$

The loss in tax revenue from the income tax reform is therefore equal to:

$$\frac{1}{S(1-S)}\mathbb{E}\left\{T'(z^*)\frac{Z_c\rho'(z^*) - Z_I\left(S - \rho(z^*)\right)}{1 + Z_c T''(z^*)}\right\}.$$

Second, households who do move also adjust their labor supply. The change in fiscal revenues due to movers in response to the income tax perturbation is:

$$\mathbb{E}\left\{f_{\xi|\theta}\left(V_1^*\left(0\right)-V_0^*\left(0\right)\right)\left\{\frac{\partial U_o^*(\Theta)}{\partial c}\left(S-\rho\left(z_0^*\right)\right)-\frac{\partial U_1^*(\Theta)}{\partial c}\left(S-\rho\left(z_1^*\right)\right)\right\}\left[T\left(z_1^*\right)-T\left(z_1^*\right)\right]\right\}$$
$$=\mathbb{E}\left\{\frac{dS}{dq}\left[T\left(z_1^*\right)-T\left(z_1^*\right)\right]\right\}.$$

in which for some skills the term inside {} can be negative: if the behavioral response induces a move from 1 to 0, it leads to increased tax revenues for the government. We compare the movers term of PBR to the one of the Income Tax reform that mimics it. We compare the movers term of PBR to the one of the Income Tax reform that mimics it, for households with skill θ :

$$\frac{dB_{movers}}{d\Delta}-\frac{dB_{movers}}{dq}=f_{\xi|\theta}\left(V_1^*\left(0\right)-V_0^*\left(0\right)\right)\left(\rho\left(z_0^*\right)\frac{\partial U_o^*(\Theta)}{\partial c}+\left(1-\rho\left(z_1^*\right)\right)\frac{\partial U_1^*(\Theta)}{\partial c}\right)\left[T\left(z_1^*\right)-T\left(z_1^*\right)\right]$$

Which is clearly <0 since the first two terms are positive and $T\left(z_1^*\right)-T\left(z_1^*\right)<0$. We conclude that $\frac{dB_{movers}}{d\Delta}-\frac{dB_{movers}}{dq}<0$

Overall,

$$\frac{dSWF}{dq}=\mathbb{E}\left[\lambda\left(\frac{\rho\left(z^*\right)-S}{S\left(1-S\right)}\right)\right]+\frac{1}{S\left(1-S\right)}\mathbb{E}\left\{T'\left(z^*\right)\frac{Z_c(\Theta)\rho'\left(z^*\right)-Z_I(\Theta)\left(S-\rho\left(z^*\right)\right)}{1+Z_c(\Theta)T''\left(z^*\right)}\right\}+\mathbb{E}\left\{\frac{dS}{dq}\left[T\left(z_1^*\right)-T\left(z_1^*\right)\right]\right\}.$$

and without income effects on labor supply:

$$\frac{dSWF}{dq}=\mathbb{E}\left[\lambda\left(\frac{\rho\left(z\right)-S}{S\left(1-S\right)}\right)\right]+\frac{1}{S\left(1-S\right)}\mathbb{E}\left\{T'\left(z^*\right)\rho'\left(z^*\right)\frac{Z_{1-\tau}}{1+Z_{1-\tau}T''\left(z^*\right)}\right\}+\mathbb{E}\left\{\frac{dS}{dq}\left[T\left(z_1^*\right)-T\left(z_1^*\right)\right]\right\},$$

where $Z_{1-\tau}(\Theta)=\frac{\partial z^*(\Theta)}{\partial(1-\tau)}>0$ denotes the compensated labor earnings response to a change in the marginal net of tax rate $1-T'\left(z^*\right)$.

A.2 Extensions

A.2.1 Preferences with income effects on labor supply

We assume here that the utility function displays income effects on labor supply, i.e., $\frac{\partial z_j^\theta}{\partial I}<0$. An additional behavioral response to both tax reforms (PBR and income tax) emerges, which we discuss here. The other terms computed in the main text remain unaffected. With income effects on labor supply, the effect of an infinitesimal lump-sum transfer Δ on tax revenues is:

$$\frac{dB_{T,stayers}}{d\Delta}=\mathbb{E}\left\{T'\left(z^*\right)\frac{dz^*}{d\Delta}|stayers\right\}=\mathbb{E}\left\{T'\left(z^*\right)\frac{dz^*}{d\Delta}\right\},$$

since the number of movers is infinitesimal.

Households who do not move in response to the PBR now adjust their earnings in response to the lump-sum PBR. Applying (19) to the PBR reform, we get:

$$dz^{*}=\frac{dz^{*}}{\partial I}\frac{S-j}{S\left(1-S\right)}d\Delta .$$

The additional change in tax revenue from the PBR reform through behavioral effect on z for stayers is therefore:

$$\frac{dB_{T}}{d\Delta}=-\mathbb{E}\left\{T'\left(z\right)\mathbb{E}\left[\frac{1}{S\left(1-S\right)}\frac{Z_{I}(\Theta)\left(S-j\right)}{1+Z_{c}(\Theta)T''\left(z\right)}|z^{*}=z\right]\right\}.$$

Regarding the income tax reform, the computation were made above. The additional term only present with income effects on labor supply is:

$$\frac{dB_{T}}{dq}=-\mathbb{E}\left\{T'\left(z\right)\frac{S-\rho\left(z\right)}{S\left(1-S\right)}\mathbb{E}\left[\frac{Z_{I}\left(\Theta\right)}{1+Z_{c}(\Theta)T''\left(z\right)}|z^{*}=z\right]\right\}.$$

Comparing the two income effects The difference between these two terms is:

$$\frac{dB_{T}}{d\Delta}-\frac{dB_{T}}{dq}=\mathbb{E}\left\{T'\left(z\right)\mathbb{E}\left[\frac{Z_{I}\left(\Theta\right)}{1+Z_{c}(\Theta)T''\left(z\right)}\left(\frac{j-\mathbb{E}\left[j|z^{*}=z\right]}{S\left(1-S\right)}\right)|z^{*}=z\right]\right\}$$

Consider the following assumption (Saez (2002)):

Assumption 2. *Conditional on each income level, behavioral response* $\frac{Z_{I}(\theta,j)}{1+Z_{c}(\theta,j)T''(z)}$ *is independent of where the household lives.*

Under Assumption 2, location choice j can be pulled out of the conditional expectation and averaged out conditional on z, leading to $\frac{dB_T}{d\Delta}-\frac{dB_T}{dq}=0$. The behavioral responses to PBR and the equivalent income tax reform coming through the income effect are exactly equal.

A.2.2 Endogeneous rents

We release the assumption made throughout the main text that house prices are fixed and exogeneous. Assume that housing in community j is provided by landowners according to a housing supply function:

$$H_{j}=H_{0j}r^{\gamma_{j}}$$

There is no a priori ordering of γ_1 vs γ_0. On the one hand, one could think that housing tends to be supplied less elastically in high wage/high skilled city, so that: $\gamma_0 < \gamma_1$. On the other hand, one could think that distressed areas are on the vertical part of their housing supply function, since they are under populated compared to their historical stock of housing (Glaeser and Gyourko 2005). In this case, one could think that $\gamma_0 > \gamma_1$. This is ultimately an empirical question. The price of housing can be written as a function of city population $L_j = jS(\Delta) + (1-j)(1-S(\Delta))$:

$$r_j(L_j) = \left(\frac{L_j}{H_{0j}}\right)^{\frac{1}{\gamma_j}}$$

For a PBR scheme Δ, population is $L_j = jS(\Delta) + (1-j)(1-S(\Delta))$. We assume that landlords are valued in the social welfare function at some weight ω^{land}:

$$SWF \equiv \mathbb{E}\left[\omega^h G\left(v^h\right)\right] + \mathbb{E}\left[\omega^{land} r\right],$$

where possibly $\omega^{land} = 0$ (absentee landlords assumption). Let L_j^l denote the number of landowners in j, $\bar{\lambda}_j^l$ their average welfare weight. We define $\bar{\Gamma}_j = \frac{L_j^l}{L_j}\bar{\lambda}_j^l$.

A PBR reform generates a net transfer of utility from inhabitants of community 0 to those of community 1, measured by:

$$\frac{dW}{d\Delta}|_{\Delta=0} = \bar{\lambda}_1 - \bar{\lambda}_0 + \frac{dS}{d\Delta}\left(\frac{r_0}{\gamma_0}\left(\bar{\lambda}_0 - \bar{\Gamma}_0\right) - \frac{r_1}{\gamma_1}\left(\bar{\lambda}_1 - \bar{\Gamma}_1\right)\right),$$

where $\bar{\lambda}_j - \bar{\Gamma}_j$ measures the social value of transferring a dollar from landlords to households in community j. Under the assumption of absentee landlords, the formula becomes:

$$\frac{dW}{d\Delta}|_{\Delta=0} = \bar{\lambda}_1 - \bar{\lambda}_0 + \frac{dS}{d\Delta}\left(\frac{r_0}{\gamma_0}\bar{\lambda}_0 - \frac{r_1}{\gamma_1}\bar{\lambda}_1\right). \quad (20)$$

We see that taking into account endogenous rents leads to an additional effect of the PBR, as movers change the price of housing for all infra-marginal households. The sign of this additional term is a priori ambiguous, as $r_1 < r_0$ but $\lambda_1 > \lambda_0$. It is interesting to note the role played by the difference in housing supply elasticity γ_j between locations on the welfare effect of PBR. To highlight it, we assume for simplicity that $r_j\lambda_j \sim$ constant, so that the sign of the extra term is the sign of $\frac{1}{\gamma_0} - \frac{1}{\gamma_1}$. If high-income areas also happen to be housing-supply inelastic, while low income area have more elastic housing supply ($\gamma_0 < \gamma_1$),then the rent effect is favorable to PBR. Movers relocate out of congested places, prices react downwards strongly to these moves, while they react midly upwards in the destination area. Taxing highly inelastic areas like Manhattan, and redistributing to more elastic areas like its suburbs leads to this additional positive effect of PBR. On the other hand, it can be that distressed areas are on the vertical part of their housing supply curve (γ_1 low), when they are areas like Detroit or the Appalachian with a large stock of unused housing (Glaeser and Gyourko (2005)). In this case, the rent effect can turn to negative - increase in housing costs in the Distressed area, because of movers, outweights the decrease in housing cost in Elsewhere, acting as an additional efficiency cost to account for when evaluating the effect of a PBR scheme. Beyond this additional welfare term, there is no other efficiency cost to account for when recognizing that prices are endogeneous (we do not take into account property taxes in this derivation). We can then derive the overall effect of a PBR scheme when rents are endogeneous:

Lemma. *The first order effect on welfare of a small PBR reform starting from a place-blind system is:*

$$\frac{dSWF}{d\Delta}(0) = \bar{\lambda}_1 - \bar{\lambda}_0 + \frac{\partial S}{\partial \Delta}\left(\frac{r_0}{\gamma_0}\left(\bar{\lambda}_0 - \bar{\Gamma}_0\right) - \frac{r1}{\gamma_1}\left(\bar{\lambda}_1 - \bar{\Gamma}_1\right)\right) + \mathbb{E}_\theta\left\{\frac{dS^\theta\left(0\right)}{d\Delta}\left[T\left(z_1^\theta\right) - T\left(z_0^\theta\right)\right]\right\} \tag{21}$$

where $\bar{\Gamma}_j = 0$ *with absentee landlords.*

A.2.3 Alternative specification of locational preferences

In this section, rather than assuming that idiosyncratic choices of locations are driven by additive preference shocks as in the main text (equation1), we consider a more general formulation where households have idiosyncratic producitivty in both locations, as well as idiosyncratic preferences for location. They are therefore characterized by a quadruple $\Theta = \{w_0, w_1, \varepsilon_1, \varepsilon_2\}$ distributed according to the CDF $F(.)$. Furthermore, we do not restrict the preference shocks to enter additively in the utility function. That is, we assume that:

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

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

Main results The logic of the derivations in the main text 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 Δ as:

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

We have

$$\frac{dS}{d\Delta} = \lim_{\Delta \to 0} \int_{\Theta \in \mathbb{R}^4} \left[\frac{j^*(\Theta, \Delta) - j^*(\Theta, 0)}{\Delta} \right] dF(\Theta)$$

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

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

where the last line follows because $T(z_1^*(\Theta, \Delta)) = T(z_1^*(\Theta, 0))$: 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:

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

The main results of the paper are amended 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:

$$\frac{dSWF}{d\Delta} = \bar{\lambda}_1 - \bar{\lambda}_0 + \frac{dS}{d\Delta}\mathbb{E}\left\{[T(z_1^*(.,0)) - T(z_0^*(.,0))]\,|move\right\} \tag{22}$$

- The difference between the efficiency cost of a PBR and the one of a corresponding income tax reform is:

$$\frac{dB}{d\Delta} - \frac{dB}{dq} = \lim_{\Delta \to 0} \int_{\Theta \in \mathbb{R}^4} \left[\frac{j^*(\Theta, \Delta) - j^*(\Theta, 0)}{\Delta} \left(\left[T\left(z_1^*(\Theta, 0)\right) - T\left(z_0^*(\Theta, 0)\right) \right] \right) \right] dF(\Theta) \tag{23}$$
$$- \lim_{q \to 0} \int_{\Theta \in \mathbb{R}^4} \left[\frac{j^*(\Theta, q) - j^*(\Theta, 0)}{q} \left(\left[T\left(z_1^*(\Theta, 0)\right) - T\left(z_0^*(\Theta, 0)\right) \right] \right) \right] dF(\Theta)$$
$$- \mathbb{E}\left\{ T'(z^*) \frac{\rho'(z^*)}{S(1-S)} \frac{Z_{1-\tau}}{1 + Z_{1-\tau} T''(z^*)} \right\}$$

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.

A.2.4 Pitfalls of non-additive idiosyncratic shocks

With additively separable idiosyncratic preferences for location, the social welfare weights λ_z^j are not direct functions of ε_j - they are only indirectly impacted by idiosyncratic preferences through their effect on choice of city j. So welfare weights are functions of j (as well as z, $w_j(\theta)$), but not of ε_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 shocks ε_j, they only depend on their indirect impact on the observed location choice j. In contrast, when the λ's directly depend on the value of ε_j, the definition of ε_j obviously matters for welfare. Unfortunately, as we show in the example below, one can easily build examples where two alternative models of ε_j 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.[21] 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. $SWF = \int G\left(U^h\right) dh$, as examined for instance in Kessing et al. (2020).

Example Consider a simple utility function:

$$U\left(c^\alpha h^{1-\alpha} + \varepsilon_j\right)$$

[21] Davis and Gregory (2020) discuss a related point: multiplicative preference shocks commonly used in Economic Geography model are typically not identified but influence marginal utility of consumption, hence social preferences. They propose to adjust the planner's problem to neutralize the influence of these shocks on marginal utility of consumption. Our setup with additive shocks avoids this pitfall.

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

$$U\left(\frac{z_1(\theta)}{P_1} + \varepsilon_1\right) > U\left(\frac{z_0(\theta)}{P_0} + \varepsilon_0\right),$$

ie iff

$$\varepsilon_1 - \varepsilon_0 > \frac{z_0(\theta)}{P_0} - \frac{z_1(\theta)}{P_1}. \tag{24}$$

Note that the values of ε_1 and ε_0 separately play no role in any of the observable choices of households, so that ε_1 and ε_0 are not separately identified. We then consider two alternative models: in model (a), $\varepsilon_0 = 0$ while ε_1 is an iid shock with some positive variance. In model (b), $\varepsilon_1 = 0$ while ε_0 is an iid shock with some positive variance. Both models can rationalize the exact same same sorting equilibrium, as they can rationalize the same distribution of $\varepsilon_1 - \varepsilon_0$, which drives sorting. The two models are therefore observationally equivalent. Interestingly though, they have opposite welfare (PBR-related) implications. To make the point very stark, we assume that $P_1 = P_0$ and normalize it to 1, and we also assume that $z_0(\theta) = z_1(\theta)\,(\equiv z(\theta))$ in what follows. We compute λ_j^θ the social welfare weight of type θ in city j:

$$\lambda_j^\theta = U'(z(\theta) + \varepsilon_j)\frac{1}{\phi}$$

We now compare λ_0^z to λ_1^z to determine the direction of desirablity of redistribution within earnings[22] implied by the two models. In model (a), households are in 1 iff

$$\varepsilon_1 - \varepsilon_0 > \frac{z_0(\theta)}{P_0} - \frac{z_1(\theta)}{P_1},$$

ie, given our simplifying assumptions, iff $\varepsilon_1 > 0$. Therefore, given that U is concave

$$\lambda_1^z = U'(z + \varepsilon_1)\frac{1}{\phi} < U'(z)\frac{1}{\phi} = \lambda_0^z$$

and redistribution within-earnings from 1 to 0 is desirable.

In model (b), households are in 1 iff

$$\varepsilon_1 - \varepsilon_0 > \frac{z_0(\theta)}{P_0} - \frac{z_1(\theta)}{P_1},$$

[22]If we had productivity differences, we would be comparing here within-skill redistribution, but the point would still hold.

ie, given our simplifying assumptions, iff $\varepsilon_0 < 0$. Therefore households who live in 0 are such that $\varepsilon_0 > 0$,

$$\lambda_1^z = U'(z)\frac{1}{\phi} > U'(z+\varepsilon_0)\frac{1}{\phi} = \lambda_0^z,$$

and redistribution within-earnings from 0 to 1 is desirable.

This example illustrate the pitfalls of allowing welfare weights to directly depend on ε_j, rather than indirectly based on city choice only.

B Survey Appendix

Section 5.4 presented results from our online survey of Amazon Mechanical Turk (MTurk) U.S. online laborers. We now present further details on the survey and its results.

We conducted the survey in two batches. We launched one request for 550 responses at 10am Pacific Time on Thursday July 9, 2020, and a second request for 550 responses at 10am Pacific Time on Friday, July 10, 2020. We surveyed 1,100 useres in order to ensure at least 1,000 valid responses. We chose 10am Pacific Time so that the survey would be launched during business hours throughout the continental United States. We used unique MTurk identification numbers to prevent MTurk users who took the survey on July 9 from taking it again on July 10, or from retaking either day's survey again on the same day. Thirty respondents had invalid MTurk IDs or failed an attentiveness question (identifying a hand-drawn picture of a flower as a flower), leaving us with 1,070 valid responses.

The survey asked questions in the following order: the neighborhood and regional questions displayed in Figure 3a (in random order), a single follow-up question eliciting explanations from the respondent for their neighborhood and regional answers, a General Social Survey question on redistribution attitudes, demographic questions, and the attentiveness question.

MTurk survey respondents need not conform to nationally representative respondents. Indeed, MTurk respondents tend to be younger and more highly educated than the average American, despite the low wages offered on MTurk. In order to gauge how representative MTurk attitudes for redistribution may be, we followed Fisman et al. (2020) in asking respondents a standard question from the General Social Survey (GSS) on redistributive attitudes:

Some people think that the government in Washington ought to reduce the income differences between the rich and the poor, perhaps by raising the taxes of wealthy families or by giving income assistance to the poor. Others think that the government should not concern itself with reducing this income difference between the rich and the poor. Here is a card with a scale from 1 to 7. Think of a score of 1 as meaning that the government ought to reduce the income differences between rich and poor, and a score of 7 meaning that the government should not concern itself with reducing income differences. What score between 1 and 7 comes closest to the way you feel?

In the 2018 GSS, 50% of respondents reported that the government ought to reduce income differences between rich and poor (i.e., gave a score between 1 and 3), 33% reported that the government should not concern itself with reducing income differences (i.e., gave a score between 5 and 7), and 17% reported the middle score of 4.[23] As in Fisman et al., we find a similar distribution of scores in our MTurk survey: 44% reported that the government ought to reduce income differences between rich and poor, 32% reported that the government should not concern itself with reducing income differences, and 24% reported the middle score.

Figure 3a presented our main survey results with 95% confidence intervals: the share of respondents selecting each option for distributing tax credits to poor families across space. Online Appendix Table 1a lists the precise numbers in table form, with standard errors in parentheses. Online Appendix Table 1b lists the full joint distribution of answers to the urban and regional questions. Approximately half of respondents (51% in the urban question and 48% in the regional question) chose to target the hypothetical tax credit to poor families in the distressed areas. One-third (32%) chose to target the tax credit to both distressed urban areas and distressed rural areas while two-thirds (66%) chose to target the tax credit to either distressed urban areas or distressed rural areas or both. [24]

Figure 3b presented survey responses to the follow-up question asked of the subset of respondents who chose to distribute the tax credit to poor families in distressed areas. Online Appendix Table 2a lists the precise numbers in table form, with standard errors in parentheses. The remaining panels of the table list the analogous responses to the follow-up question asked of the other four subsets of respondents, as listed in the panel headings. Each panel lists responses in descending order of response frequency; respondents were asked to select all that apply.

As noted in the main text and shows in Online Appendix Table 2a, a large majority – 78% – of those

[23] These answers can be accessed in NORC's GSS Data Explorer: https://gssdataexplorer.norc.org/variables/243/vshow.

[24] We do not find that question order significantly predicts answers. If one restricts attention to respondents who provided the same answer to the urban question as they did to the regional question – i.e., when restricting to the 583 respondents lying along the diagonal of Online Appendix Table 2b who are especially unlikely to have provided random answers – one finds that 60% prefer distribution to poor families in distressed areas.

choosing to target the tax credit to poor residents of distressed areas explain their choice with the reasoning: "Poor families in distressed areas are worse off, since they deal with high poverty, high crime, high pollution, struggling schools, and a history of job losses." That response suggests an emphasis on utility *levels* rather than *marginal* utility. Interestingly, Online Appendix Table 2b shows that a substantial majority – 67% – of those choosing to spread the tax credit evenly to poor residents everywhere explain their choice with marginal utility reasoning: "Extra money given to poor families is equally valuable to poor families no matter where they live." Hence, standard notions of earnings being a sufficient statistic for marginal social welfare weights due to diminishing marginal utility of income do find support in the data, albeit among only a subset of respondents.

C Calibration Appendix

Section 6.2 described the calibration of our quantification excercise. We provide further details here.

C.1 Community Rent

As explained in Section 6.1, we equate each community to an amalgamation of non-contiguous Census tracts. Specifically, we rank tracts in the 2013-2017 American Community Survey (ACS) by their poverty rate and group tracts into *communities* $j \in \{1, ..., 100\}$ that each have one percent of the U.S. population. As described in Section 6.2, we also use the ACS to assign each community a median rent level, adjusted for housing quality based on number of bedrooms, number of units in the housing structure, and the age of the structure. We compute adjusted median rent as follows.

First, we estimate a hedonic contract rent equation using the individual-level 2013-2017 ACS, purged of Public Use Microdata Area (PUMA) fixed effects – PUMA being the finest local geographic identifier available in the data. Specifically, among renters of non-vacant units, we regress log contract rent on fixed effects for the number of bedrooms, fixed effects for the number of units in the residential structure, a quartic in the age of the structure, and PUMA fixed effects. Second, we apply those coefficients to tract-level medians in order to compute a tract-level residual and thereby a median rent level that is adjusted for housing quality. Specifically, for each tract, we obtain the median contract rent and median unit characteristics: the median number of bedrooms, the median number of units in the residential structure, and the median age. We then compute each tract's log median rent residual, equal to log median tract rent minus predicted log rent based on the sum of PUMA-level coefficients multiplied by the tract's median unit characteristics.

Third, we compute each tract's adjusted median rent as the exponentiated sum of the log median rent residual plus the PUMA-level coefficients multiplied by the median U.S. unit characteristics. Finally, for community rent in the quantitative exercise, we use each tract's normalized adjusted median rent, equal to each tract's adjusted median rent divided by the maximum tract adjusted median rent across the one hundred communities. The resulting rent levels range from 0.40 to 1.

C.2 Community Productivity

As described in Section 6.2, we use the Hornbeck and Moretti (2019) Metropolitan Statistical Area productivity-rent gradient in order to assign a productivity level to each community based on its adjusted median rent. Specifically, in the year-2000 Hornbeck-Moretti data (the most recent year available), we regress Hornbeck-Moretti's estimated log MSA total factor productivity on log MSA mean rent (see their Table 2). We find a coefficient of 0.254 (robust standard error 0.052). Hence, we set community productivity equal to community rent raised to 0.254.

C.3 Community Earnings Distribution

As described in Section 6.2, we use community earnings distributions from the 2013-2017 ACS in order to calibrate the skill distribution parameters $\{\mu_\theta, \sigma_\theta\}$ and the amenity valuation parameters $\{a_j(\theta)\}$. Specifically, the tract-level ACS aggregates contain each tract's annual household income distribution along ten income bins defined by nine annual household income thresholds: \$10,000, \$15,000, \$25,000, \$35,000, \$50,000, \$75,000, \$100,000, \$150,000, and \$200,000. We aggregate these household income distributions across tracts within our hundred communities in order to obtain a household income distribution for each community.

The ACS household income measure includes labor earnings, capital income, and some government transfers. In contrast, our quantitative model does not include capital income and does not distinguish among different types of government transfers. We therefore calibrate the model to match each community's labor earnings distribution, after translating each household income threshold into an analogous household earnings threshold. Specifically, in the 2013-2017 individual-level ACS, we compute mean household labor earnings (wages, salary, commissions, bonuses, and tips from all jobs) within symmetric two-thousand-dollar ranges around each of the nine household income threshholds in the 2013-2017 tract-level ACS. For example, we find that mean household labor earnings among households with household income in the range

[$9,000,$11,000] is $4,300.

In this way, we arrive at nine annual household labor earnings thresholds: $4,300, $9,600, $19,500, $28,500, $42,000, $64,700, $88,000, $132,400, and $180,200. For each community, we assign each the mass in each household income bin to the analogous household earnings bin. Finally, we combine the bottom two bins into one, which we found aided simulation fit in certain permutations. Hence, our final nine earnings bins are defined by the eight thresholds: $9,600, $19,500, $28,500, $42,000, $64,700, $88,000, $132,400, and $180,200.

C.4 Current Tax-and-Transfer System

Our calibration requires an approximation of the current all-in tax-and-transfer system that applies to the average U.S. household, including redistribution at all levels of government. Specifically, we require an approximation of taxes-paid-minus-transfers received ("net taxes") as a function of pre-tax-and-transfer-income ("pre-tax income"). We obtain that approximation using the distributional national accounts (DINA) of Piketty, Saez, and Zucman (2018), which distributes across U.S. individuals all U.S. national income and all taxes paid to all levels of U.S. governments.

We adopt the following sample restrictions in the public-use DINA files. We compile all individuals in the 2013-2017 DINA files; those years align with our use of the 2013-2017 ACS. We aggregate the annual records of individuals to the annual tax unit level, in order to reflect the tax code. Because our quantification exercise includes labor income but not capital income, we restrict attention to annual household records in which the wages, salaries, and tips reported on tax returns comprise between 99% and 100% of their total income reported on tax returns.[25] Since our model abstracts from savings and the elderly consume out of savings and pay concommittant consumption taxes, we restrict attention to annual household records in which the taxpaying adults (either the lone taxpayer or both taxpayers of a married couple) are aged 30-55. We restrict to households with pre-tax income (defined below) under $500,000, which exceeds the maximum pre-tax income we find in our baseline quantitative exercises.

We define pre-tax income and net taxes as follows. Because our quantification exercise includes labor income but not capital income, we define pre-tax income as pre-tax-and-transfer *labor* income. Hence, our income concept does not include actual or imputed capital income, such as imputed rental income from

[25]For households that do not file taxes, the DINA files include synthetic records with values imputed based on the Current Population Survey and other data sources.

owner occupied housing. Similarly, we define net taxes as taxes paid on labor income and consumption minus government transfers. Hence, our net taxes concept does not include taxes directly attributable to wealth or capital income, such as property taxes or corporate income taxes (whose incidence DINA assumes falls entirely on capital). We handle contributory social insurance taxes – i.e., taxes like Social Security taxes, unemployment insurance taxes, and workers compensation taxes that fund future transfers to contributing individuals – in a simple and straightforward way: we exclude those taxes and the accompanying transfers from our net taxes concept.[26]

We implement our pre-tax income and net taxes definitions in the DINA files as follows. We set pre-tax income equal to DINA personal factor labor income. Personal factor labor income equals employee compensation (equal to employee wages and benefits) plus the labor component of mixed income (i.e., self-employment income assumed attributable to labor rather than capital) plus assumed sales and excise taxes falling on labor.[27] We set net taxes equal to the sum of DINA federal and state personal income taxes, sales and excise taxes, and non-contributory social insurance taxes (essentially Medicare taxes), minus the sum of DINA cash and cash-like transfers (e.g., refundable tax credits, food stamps, and Supplemental Security Income) and in-kind transfers (e.g., Medicaid, Medicare, and Pell grants).[28] Taxes paid tend to be negative for low-pre-tax-income households, which indicates that they receive net transfers from the tax-and-transfer system, while taxes paid tend to be positive for high-pre-tax-income households.[29]

Our quantitative excercise uses a three-bracket income tax-and-transfer system, with bracket kink points at \$20,000 and \$80,000 and with a universal lump-sum transfer. We therefore estimate the best-fit three-

[26]This exclusion embodies the view that such taxes are insurance benefits valued at cost and consumed in the year they are paid. Valuing insurance benefits in the year insurance contributions are made is reasonable given the ex ante value of insurance. Alternative views from the one we adopt are difficult to implement in annual cross-sectional data. For example, counting Social Security taxes as a pure tax on working-age households ignores the large transfers that those benefits will trigger later in life. Panel data would permit a researcher to compute Social Security taxes paid minus Social Security benefits received, but the DINA files are annual cross sections.

[27]In terms of DINA variables, pre-tax-and-transfer income equals flinc ("personal factor labor income", equal to employee wages and benefits plus the labor component of mixed income plus the labor component of sales and excise taxes). Employee wages and benefits includes employer payroll taxes and unemployment insurance contributions. Sales and excise taxes are part of national income and are part of the taxes that households pay when consuming after-tax-and-transfer income, so those taxes must be counted as pre-tax-and-transfer income as well. DINA allocates those taxes to individuals according to their labor and capital income; personal factor labor income includes only the portion of sales and excise taxes attributable to their labor income.

[28]Medicare taxes are non-contributory taxes: Medicare is an "entitlement" that is not limited to those who have paid in to the system. Medicare is available to working-age households with specific conditions, such as end stage renal disease or a disability that qualifies them for Social Security Disability Insurance. In terms of DINA variables, taxes paid the sum of ditaf ("Federal personal income tax gross of refundable tax credits"), ditas ("State personal income tax"), salestax ("Sales and excise taxes"), and othercontrib ("Contributions for government social insurance other than pension, UI, DI"), minus the sum of dicab ("Social assistance benefits in cash") and inkindinc ("Social transfers in kind").

[29]The average value of taxes paid is positive, primarily because we exclude public goods consumption – including defense procurement, most government salaries, and other government expenditures that are not individualized transfers – from net taxes.

bracket income tax-and-transfer system on the DINA data, using OLS regression of net taxes on a three-segment linear spline in pre-tax income. The resulting coefficients equal our approximation of net taxes $T(z)$ as a function of pre-tax income z:

$$T(z) = -11300 + .438z + .161(z - 20000) I^{z>20000} + .271(z - 80000) I^{z>80000}$$

where $I^{z>20000}$ and $I^{z>80000}$ are indicators for pre-tax income lying above \$20,000 and \$80,000, respectively. In the DINA data, the lump-sum transfer of \$11,300 reflects a combination of cash and cash-like transfers like Supplemental Security Income and food stamps and in-kind transfers like Medicaid. The high effective marginal tax rate of 43.8% in the \$0-\$20,000 income tax bracket largely reflects the phase-out ranges of low-income transfers. The low effective marginal tax rate of 16.1% in the \$20,000-\$80,000 income tax bracket reflects relatively low statutory income tax rates after deductions and exemptions and continued phase-outs. The higher effective marginal tax rate of 27.1% in the \$80,000+ income tax bracket reflects higher statutory income tax rates at higher earnings.[30] Notably, standard optimal income tax systems similarly exhibit a U-shaped pattern of marginal tax rates with a five-digit lump-sum transfer (e.g., Saez 2001).[31]

C.5 Calibration Procedure

We jointly calibrate the lognormal skill distribution parameters $\{\mu_\theta, \sigma_\theta\}$ and the amenity parameters $\{a_j(\theta)\}$ using a minimum distance algorithm between moments of the model and equivalent moments in the data. The amenity parameters are calibrated in order for the model to exactly match each community's share of each of nine nationwide household earnings bins based on the ACS tract-level aggregates described in Appendix Section C.3. The nine household earnings bins are the same as those computed from the ACS in Appendix Section C.3 and are defined by the following eight earnings thresholds: \$9,600, \$19,500, \$28,500, \$42,000, \$64,700, \$88,000, \$132,400, and \$180,200. The skill-distribution parameters are calibrated in order to minimize the sum of square deviations from the share of the nationwide population with earnings in the bottom two ACS-based bins (i.e., below \$19,500) and the share with earnings in the top three ACS-based bins (i.e., above \$88,000).

[30] The 2015 federal marginal tax rate for a married couple earning \$80,000 was 15% and for a single filer was 25%. Our approximation somewhat overestimates taxes paid among middle earners and underestimates taxes paid among the highest earners.

[31] Note that Piketty, Saez, and Zucman (2018) and Saez and Zucman (2019) report relatively flat average tax rates across the income distribution using the DINA data. Their calculations include contributory social insurance taxes and do not include transfers.

The calibration comprises two loops: an outer loop and an inner loop. Let $d(z)$ denote the ACS earnings bin into which earnings level z falls. We allow each of the one hundred communities to have nine amenity levels, one for each earnings bin, so that $a_j(\theta) = a_{jd(z(\theta))}$. In the outer loop, we take the amenities $\{a_{jd}\}_{j=1,d=1}^{100,9}$ as given and find the skill distribution parameters $\{\mu_\theta, \sigma_\theta\}$ that minimize the sum of squared residuals between the model-predicted and actual shares of households with earnings less than \$19,500 and greater than \$88,000.

In the inner loop, we find amenity levels needed to match the actual share of the U.S. population in community j and earnings bin d using the fixed point algorithm of Berry et al. (1995). Specifically, we update the amenity parameters as follows until they are updated trivially:

$$\{a_{jd}\}_{j=1,d=1}^{100,9} = \{\tilde{a}_{jd}\}_{j=1,d=1}^{100,9} + \left\{\ln\pi_{jd}^{\text{truth}}\right\}_{j=1,d=1}^{100,9} - \{\ln\pi_{jd}\}_{j=1,d=1}^{100,9}$$

where the right-hand-side terms are constructed as follows. We compute recentered amenity parameters:

$$\{\tilde{a}_{jd}\}_{j=1,d=1}^{100,9} = \{a_{jd}\}_{j=1,d=1}^{100,9} - \frac{1}{DJ}\sum_{d'=1}^{D}\sum_{j'=1}^{J} a_{j'd'} - 1$$

such that by construction:

$$\frac{1}{DJ}\sum_{d=1}^{D}\sum_{j=1}^{J}\tilde{a}_{jd} = 1.$$

We compute each community's share of each earnings bin's nationwide earnings bins in the ACS data $\left\{\pi_{jd}^{\text{truth}}\right\}_{j=1,d=1}^{100,9}$. Given the outer loop's skill distribution and the initial amenities $\{a_{jd}\}_{j=1,d=1}^{100,9}$, we compute each community's share of each earnings bin's nationwide population in our model $\{\pi_{jd}\}_{j=1,d=1}^{100,9}$.

The inner loop adjusts the nine hundred amenity parameters to exactly match the share of each earnings bin that resides in each community in the ACS. However, the outer loop's two lognormal parameters do not yield an exact match to the nationwide earnings distribution in the ACS. As a result, each community's population deviates from 1%. However, the deviations are relatively small in practice: community populations range from 0.9% to 1.1%, with the highest-poverty and lowest-poverty communities have lower population than middle-poverty communities, because the lowest earners and highest earners are slightly underrepresented nationally.