Place-Based Redistribution*

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Abstract

We study the equity-efficiency tradeoffs that arise when taxes may be indexed to location in addition to labor income. 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, lump-sum 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. Expressions for the optimal transfer size are provided 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 within income groups, 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 within income groups. Responses indicate strong support for targeting tax relief to poor households who live in distressed places. A calibration exercise suggests that optimal place-based transfers may be of the same order of magnitude as found in some 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 (Bartik, 1991; Glaeser and Gottlieb, 2008; Kline and Moretti, 2014b; Duranton and Venables, 2018). Prominent examples include the U.S. Opportunity Zones, which provide preferential capital gains tax treatment to the poorest 10% of U.S. local areas, and European Union Structural Funds, which provide transfers to poor regions of EU member countries. The espoused rationale for such programs is typically redistributive: because poor people are concentrated in certain places, targeting these areas helps disadvantaged households. However, governments already redistribute to poor places through national income taxes as well as individual-earnings-based transfer systems, such as 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 (Rosenstein-Rodan, 1943; Flatters et al., 1974; 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 motivating place-based policies or studying how these policy tools alter the equity-efficiency tradeoff national governments face.

In this paper, we study conditions under which place-based redistribution (henceforth, PBR) schemes are able to achieve redistributive goals at lower efficiency cost than corresponding "place-blind" transfers implemented through income taxation. 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 skill and 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 and choice of location.[1] The planner can redistribute across earnings groups using a conventional place-blind income tax schedule. She can also implement a PBR scheme whereby a head tax is levied on residents of Elsewhere and rebated to residents of Distressed. When poor households sort to Distressed, moving a dollar from the average Elsewhere resident to the average resident of Distressed 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 tax revenue. To build intuition, we discuss some special cases where these efficiency costs disappear, either because no workers are indifferent between the two locations, or because earnings do not change with moving. However, efficiency costs can be large when many households are indifferent between residing in Distressed and Elsewhere, when productivity differences between the communities are large, or when amenities and leisure are substitutes.

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 subsidy equal the 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 answered by this formula is whether PBR can improve on an optimal tax system. Classic results in public economics establish conditions under which commodity taxation can improve welfare over and above optimal income taxes (Atkinson and Stiglitz, 1976; Saez, 2002). The prototypical result in this literature is that such indirect taxation will tend to be superfluous whenever heterogeneity in consumption bundles across income groups is entirely attributable to the causal effect of income. In this polar case, commodity taxes distort labor supply as much as income taxes, while also distorting the

[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.

consumption bundle. Because two distortions are worse than one, commodity taxes are suboptimal. Our modeling environment differs in important ways from the traditional commodity taxation problem because locational choice can affect labor productivity and is a discrete decision that determines the price of another consumption good (housing). Moreover, there are good reasons to believe that poor households locate in poor places for reasons other than that they are poor. Indeed, workhorse models of locational choice typically attribute locational sorting to preference heterogeneity (Bayer et al., 2007; Busso et al., 2013), 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), rather than income effects. Finally, while commodity taxes are typically constrained to be linear to forestall the possibility of tax avoidance via resale, place-based taxes can be nonlinear because place of residence is typically straightforward for governments to verify (Moretti and Wilson, 2019).

To assess the potential for PBR to improve on optimally chosen income taxes in our more complex environment, we consider a class of income tax reforms that yield the same equity gains across income groups as a small lump sum transfer to Distressed. Like PBR, the income tax reform can induce some households to move, which yields a potential fiscal cost. Income taxes also affect the labor supply of households that do not change location. When the sorting of poor households to Distressed is driven by factors other than income effects, the efficiency costs of income taxation can exceed those of PBR. However, 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 income.

We discuss several reasons, unique to the urban economics setting, that might plausibly lead a planner to favor within-income redistribution across space. One is that a dollar goes further in Distressed due to the lower cost of living, 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. Finally, place-based policies are sometimes motivated on non-utilitarian grounds, such as to redress past injustices, concerns which can be addressed with generalized social welfare weights (Saez and Stantcheva, 2016).

To gauge public attitudes on spatial redistribution within income groups, we designed a survey on

Amazon's Mechanical Turk platform that asks respondents to decide between three equally costly policies offering tax credits to poor households. The first policy offers a generous tax credit to poor households living in heavily distressed areas. The second offers the same credit only to poor households living in "thriving" areas. The third offers a less generous place-blind credit to poor households everywhere. Remarkably, we find a strong plurality of 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 income groups, but also within income groups across space.

Since PBR's desirability is ultimately a quantitative question, we conclude with a detailed quantitative calibration. Using a standard specification of preferences with isoelastic labor supply, additively separable amenity values, 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).

The tax schedule is approximated as a three bracket system plus a lump-sum transfer. In our baseline specification, the place-based transfer is targeted to the 1% of US Census tracts with the highest poverty rates. Solving the planning problem numerically, we find that the optimal revenue-neutral transfer to these tracts is approximately $5,400 per resident, over and above the optimal place-blind income tax system. The optimal 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. While our calibration results are only suggestive, they accord strongly with the theoretical message of our paper that PBR may serve as a useful complement to income-based taxation. PBR helps improve the equity-efficiency tradeoff when income groups are highly geographically segregated. 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 tendency of poor households to cluster into particular Census tracts has been extensively documented (Jargowsky, 1997, 2013). 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%.

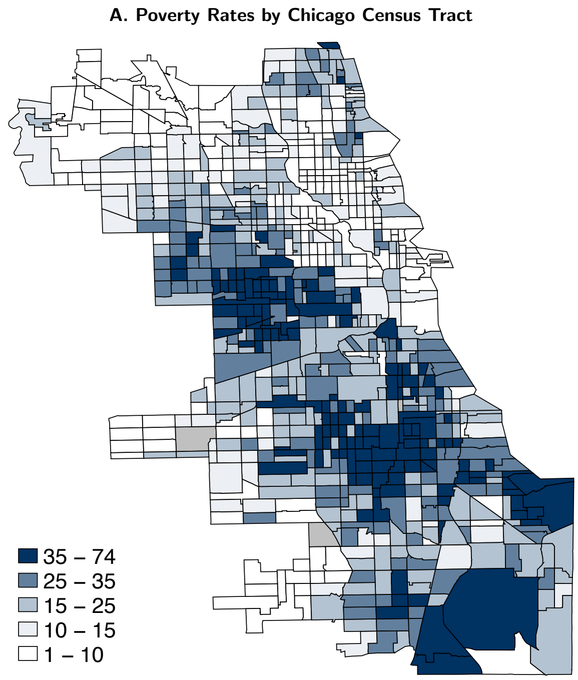
Figure 1a illustrate the spatial concentration of poverty in Chicago, Illinois – America's third largest city. Darker areas indicate higher poverty tracts in the 2013-2017 ACS. Tracts on the West Side and on the South Side have poverty rates exceeding 50%, while tracts in and around the Gold Coast neighborhood 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.

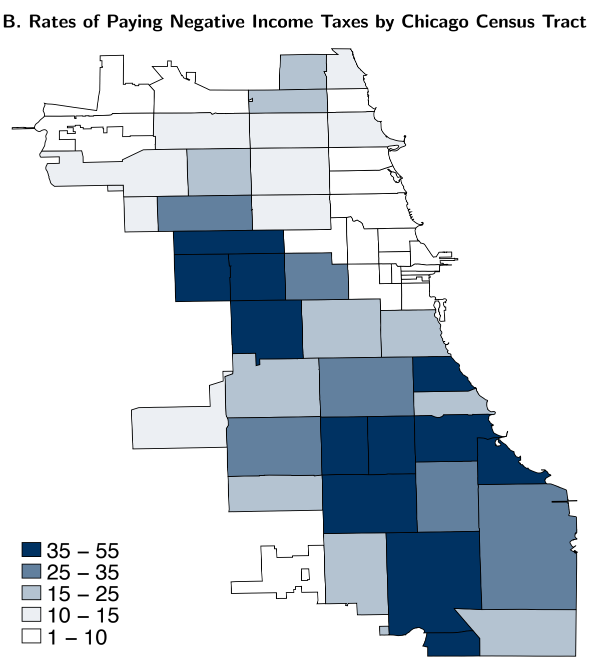
However, place-blind transfers based on household income also redistribute to poor households on the West and South Side. Figure 1b uses a ZIP-code map of Chicago to plot the share of tax filing units paying negative federal income taxes (i.e., the share receiving a net transfer from the federal income tax system), due to the Earned Income Tax Credit targeted to low earners. Half of tax filers in parts of the West and South Sides have negative income tax bills, echoing the previous map.

While both place-based and income-based redistribution can generate equity gains across earnings groups, place-based redistribution additionally yields 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 might plausibly stem from several sources. For instance, disamenities in high-poverty areas can raise the marginal utility of consumption: car rides home may help to avoid local crime risks, while medication can help to asthma induced by local pollution levels.

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

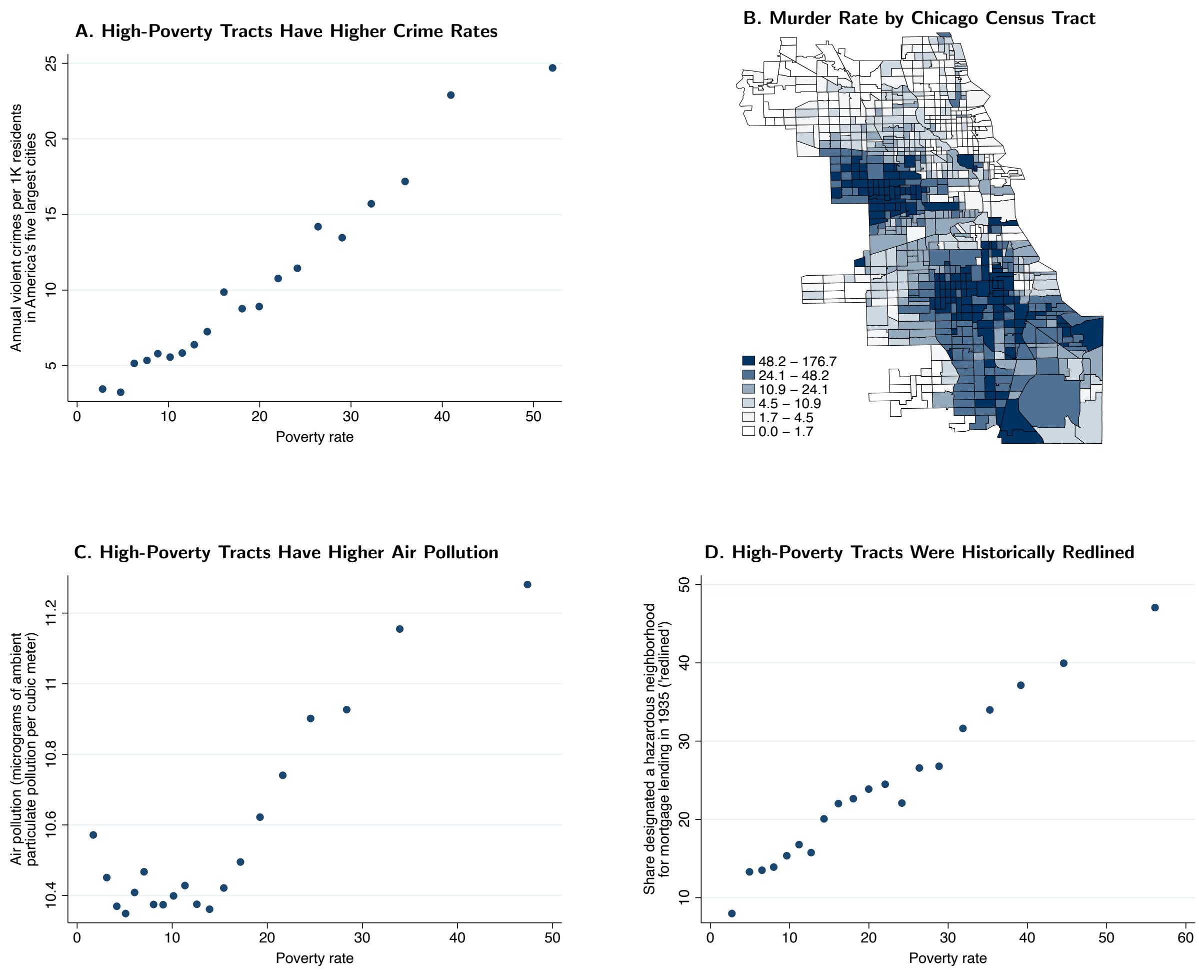
FIGURE 1: Poverty Is Spatially Concentrated





Notes: Panel A uses 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. Panel B uses 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.

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" for mortgage risk in the 1935 Home Owners' Loan Corporation maps digitized by Nelson et al.'s (2020); see the text for more detail.

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 approximately 10% higher air pollution levels than low-poverty tracts.

A desire to right place-based wrongs or other identifiable causes of hardship can also raise the marginal social value of redistribution to high-poverty areas. A prominent historical example is redlining: the practice of using borrower race or neighborhood racial composition in banks' mortgage lending decisions.[2] Concern over the historical legacy of redlining served as the impetus for a host of local and federal efforts to boost invest in 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 incomes are over-represented enhances equity. The cost of doing so comes from migration responses to the policy: some households move to places where their output is lower. The optimal place-based redistribution scheme balances the equity advantages of redistributing across place with the efficiency costs of doing so.

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,

[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 black and latinx neighborhoods continue to face related forms of statistical discrimination in the setting of property taxes (Avenancio-León and Howard, 2019).

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 $v(\Theta) = \max\{v_1(\Theta), v_0(\Theta)\}$.

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

[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.

conditional expectations operator is defined as:

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

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:

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

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.

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:*

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

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 $\frac{dS(\theta,0)}{d\Delta} =$

[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.

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

0; second, if earnings do not differ across locations for households, then $T(z_1^*) - T(z_0^*) = 0$; third, if movers are a selected sample of households for whom there is no earnings differences across locations then $\frac{dS(\theta,0)}{d\Delta}\left[T(z_1^*) - T(z_0^*)\right] = 0$. 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 $\varepsilon_j \leq 0$ 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

[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.

Distressed has high and low skill jobs. We formalize this idea with the following assumption on community wages: $w_0(\overline{\theta}) > w_0(\underline{\theta}) = w_1(\underline{\theta}) = w_1(\overline{\theta})$. For sufficiently large values of the ratio $w_0(\overline{\theta})/w_0(\underline{\theta})$, 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:*

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

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

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

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

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 $\frac{d^2 S^\theta(.,0)}{d\Delta^2} > 0$, 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:*

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

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

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

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:

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

where $\mathbb{C}\left(x^{*},y^{*}|z^{*}=z\right)=\mathbb{E}\left[x^{*}y^{*}|z^{*}=z\right]-\mathbb{E}\left[x^{*}|z^{*}=z\right]\mathbb{E}\left[y^{*}|z^{*}=z\right]$ 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 $T\left(z_{1}^{*}\right)-T\left(z_{0}^{*}\right)$ 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:

$$\frac{1}{S\left(1-S\right)}\underbrace{\mathbb{E}\left\{T'\left(z^{*}\right)\rho'\left(z^{*}\right)\frac{Z_{1-\tau}}{1+Z_{1-\tau}T''\left(z^{*}\right)}\right\}}_{\text{substitution effect}}+\underbrace{\mathbb{E}\left\{\frac{dS}{dq}\left[T\left(z_{1}^{*}\right)-T\left(z_{0}^{*}\right)\right]\right\}}_{\text{movers response}}, \tag{12}$$

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 $1-T'\left(z^{*}\right)$.

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

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

To discuss the sign of (22), we focus on the plausible setting where $\rho'\left(z\right)<0$ 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 (22) 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 (22) 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 (22), 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 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

[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.

preference for redistribution by having the planner maximize $SWF = \mathbb{E}\left[G\left(v^{*}\right)\right]$, 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:

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

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 $x \mapsto x\psi'(x)$ is increasing, i.e. 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 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

[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 $\gamma \leq 1$.

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

The utilitarian arguments for redistribution that we discuss above originate from the desire to equalize the marginal utility of consumption across households. However, place-based policies are sometimes motived, in addition, by considerations including concern over unequal utility *levels* and the righting of past injustices. 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.[11] Finally, as mentioned in Section 2, many poor communities face histories of redlining and continue to bear the burden of other forms of statistical discrimination (Avenancio-León and Howard, 2019) that are widely percieved as unfair.

As Saez and Stantcheva (2016) note, the policy implications of a variety of redistributive motives can be explored rigorously choosing high Pareto weights $\omega(\Theta)$ and thus high social marginal social welfare weights λ^* for households to which concerns pertain.[12] The commodity taxation literature (e.g., Saez, 2002) has traditionally eschewed this approach, assuming on prior grounds that the weights λ^* depend only on pre-tax earnings. While this latter approach avoids utilitarian dilemmas where the planner must redistribute to high income households with expensive tastes (Kaplow, 2008), it also rules out a number of the seemingly important equality and justice motives we have discussed above.

Because little evidence exists on social preferences for spatial equity within income groups, we explore this issue empirically in the next section.

[11] 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 distribution to families with low levels of utility for reasons outside their control.

[12] The Pareto-weight interpretation of justice motives avoids non-welfarist social preferences that violate the Pareto principle (Kaplow and Shavell, 2001).

6 Social Preferences

In classic unidimensional models of optimal taxation (e.g., Mirrlees, 1971), pre-tax earnings are a sufficient statistic for the welfare weight that the social planner places on each household. In contrast, the previous section showed that our multi-dimensional setting admits *within*-earnings distributive motives across local areas. To assess social preferences towards spatial redistribution within earnings groups, 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., 2017).

On July 9, 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. (2017), we find that answers to a GSS question on redistributive preferences broadly conforms to representative survey data. The Appendix 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 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 $100 tax credit for poor families in the distressed neighborhoods
– A $100 tax credit for poor families in the thriving neighborhoods
– A $1 tax credit for poor families everywhere

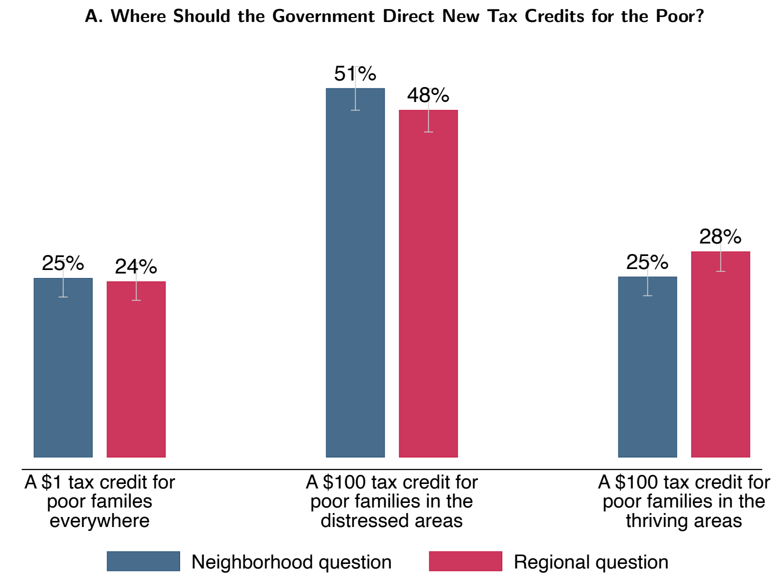
In telling the respondent that no one will work less or move as a result their choice, we aimed to remove efficiency considerations from their policy choice and therefore home in on social marginal welfare weight considerations.

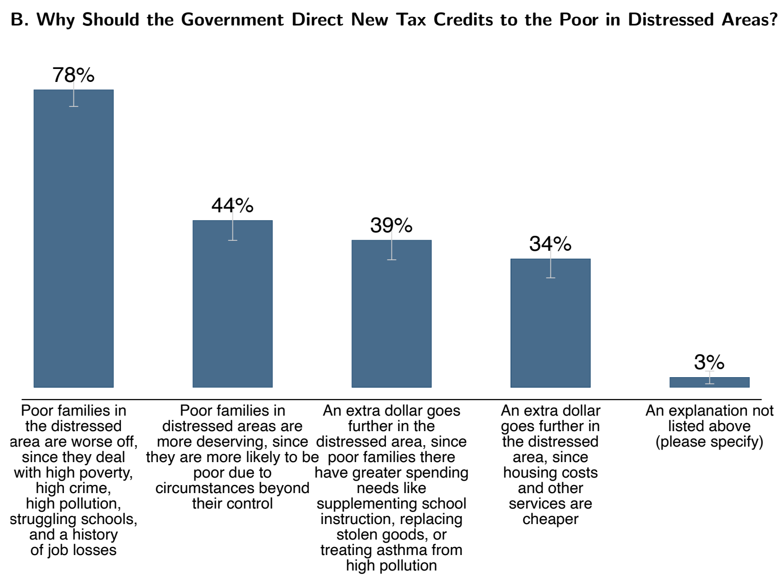
A second question was identical to the above vignette, except that it elicited within-earnings distributional preferences across regions by replacing the first background sentence with "Think about American regions that are larger than cities but smaller than states." The distressed and thriving regions 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. We find that half of respondents (51% and 48%) choose to target the benefit to poor families in distressed neighborhoods or regions, respectively. In contrast, distinct minorities choose to distribute the benefit equally to all poor families (25% and 24%) or to poor families in the thriving neighborhoods or regions (25% and 28%). Hence, the survey evidence suggests that the average American values redistribution within earnings levels toward distressed areas.

To understand respondents' rationales, we asked each respondent to explain their distributive choices.

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 among three equally costly potential tax credits that would do the most good, under the assumption of no behavioral responses: \$100 to every poor family in the distressed areas, \$100 to every poor family in thriving areas, or \$1 to every poor family everywhere. Panel A plots the results along with 95% confidence intervals. Among respondents who chose to give \$100 to poor families in distressed neighborhoods as well as in distressed regions, we asked them to select options that explain their choice; Panel B presents the results.

Here, we highlight the explanations provided by the 48% of respondents who chose to target the benefit to both distressed neighborhoods and distressed regions. 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 distribution to distressed areas state that they do so because residents there are worse off, as in the equality logic of Section 5.3. A near majority (44%) 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 income groups. The espoused rationale for such motives conflicts with the conventional view in the commodity taxation literature that policy should seek to equalize marginal utilities rather than utility levels (Atkinson and Stiglitz, 1976; Saez, 2002; Gordon and Kopczuk, 2014; Allcott et al., 2019).[14] Notably, the view that poor households living in poor places are especially disadvantaged aligns closely with a wide array of highly influential qualitative research on poor neighborhoods and regions (Wilson, 1987, 2011; Anderson, 2000; Vance, 2016).

7 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. Hence, the desirability of PBR is ultimately a

[14]Concern over utility 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).

quantitative question. As a first step in assessing what an optimal PBR scheme might look like in the US, 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. The calibration specifies spatial differences in productivity and cost-of-living, along with a parameterization of household preferences, thereby quantifying structural determinants of the equity-efficiency tradeoff.

Our theoretical analysis discussed five specific channels that, at least in extreme cases, can lead to unambiguous desirability of PBR: no productivity differences across communities ("neighborhood zones"), discrete masses of large taste shocks ("moving costs"), clustering of skilled jobs outside Distressed ("comparative advantage"), the low-skill having stronger tastes for Distressed than the high-skilled ("skill-taste correlation"), and within-earnings distributive preferences. The quantitative calibration below excludes four of these channels by imposing substantial productivity differences across communities, continuous tastes, no sorting based on comparative advantage, and no within-earnings distributive preferences. However, we follow the convention in urban economics of allowing high-skilled and low-skilled households to disagree on the valuation of locational amenities (Moretti, 2013; Diamond, 2016).

Preferences and constraints Households in our quantitative model choose from 100 communities that are amalgamations of non-contiguous Census tracts.[15] 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. Household preferences take the form:

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

where η is the Frisch labor supply elasticity, w_j indexes local wage levels, $a_j(\theta)$ gives the mean amenity level of community j for skill type θ, ε_j is an Extreme Value Type I distributed taste shock, and κ is a scale parameter governing the migration elasticity of household location decisions to local wage levels.[16]

[15] 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.

[16] Given this parameterization, the indirect utility of a type worker is $v_j(\Theta) = V_j(\theta) + \frac{1}{\kappa}\varepsilon_j$,where:

$$V_j(\theta) = \ln\left(\left(\frac{\theta w_j(1-\tau_j(\theta))}{r_j^{\alpha}}\right)^{\frac{\eta+1}{\eta}}\frac{\eta}{1+\eta}\right) + a_j(\theta).$$

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.

Parameter values Table 1 lists key moments of our model's parameters. Each rental rate r_j is set equal to that community's population-weighted mean rent in the ACS. We set $\alpha = 0.3$ to achieve a 30% housing expenditure share (Davis and Ortalo-Magne, 2011) and $\eta = 0.5$ to achieve 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). Productivity levels w_j are estimated as a function of rent r_j, based on the relationship between Metropolitan Statistical Area rent and productivity in Hornbeck and Moretti (2019) whereby log-productivity rises by 0.254 per log-point of rent. Normalizing the highest rent community's productivity w_{100} to one, the productivity in Distressed w_1 is 0.8; that is, each skill type's wage is 20% lower in Distressed than it is in the highest-rent community.

The remaining parameters $\{\mu_\theta, \sigma_\theta, a_j(\theta)\}$ are calibrated to match each community's earnings distribution across nine household earnings bins based on the ACS tract-level aggregates, as well as each community's population (1% of the total).[17] This calibration is accomplished via a minimum distance algorithm where we solve the model while assuming that the current income tax system is place blind and involves a \$10,800 lump-sum transfer (i.e. a "universal basic income") with effective tax brackets of 39.1% up \$30,000, 11.2% up to \$100,000, and 34.8% above \$100,000 based on Piketty et al. (2018).[18] For skill types θ, we discretize a lognormal distribution with parameters $(\mu_\theta, \sigma_\theta)$ into fifty equal-sized bins, each with two percent of the

Because the difference in EV1 errors is distributed logistic, the share of θ workers living in j is:

$$s_j(\theta) = \frac{\exp(\kappa a_j(\theta)) \cdot \left[\left(\frac{\theta w_j (1-\tau_j(\theta))}{r_j^\alpha} \right)^{\kappa \frac{\eta+1}{\eta}} \frac{\eta}{1+\eta} \right]}{\sum_i \exp V_i(\theta)}.$$

The parameter κ governs the migration elasticity. Specifically, it is the partial elasticity of location shares to wage, holding leisure constant : $\frac{\partial \log s_j(\theta)}{\partial \log w_j} = \kappa$.

[17] 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 an 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 \$25,000 and greater than \$100,000. In an 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). As normalization, we impose that $\sum_{j=1}^{J} a_{jd} = 0$ for each $d \in \{1, ..., 9\}$.

[18] The lump-sum transfer found in Piketty et al.'s distributional national accounts includes taxes at all levels of government and is a combination of cash transfers (e.g. Supplemental Security Income), in-kind transfers for market consumption (e.g. food stamps), and in-kind transfers for non-market consumption (namely 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.

population. Table 1 lists key moments of the calibration parameters.

Policy Variables and Budget Constraint After calibrating the model, we allow the social planner to choose both the optimal place-blind income tax $T^*(z)$ and the optimal PBR transfer Δ^* to the poorest community, which at baseline has 1% of the U.S. population. Social preferences are utilitarian (i.e., $SWF = \mathbb{E}[v^*]$) and the planner faces an exogenous revenue requirement R:

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

We set R 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 represent collective consumption like national defense rather than individual benefits like food stamps.

Note that under this specification of household and social preferences, and contrary to the survey evidence presented in Section 6, the planner has no within-earnings redistributive motives: $\lambda_z^j = \lambda_z$, $\forall j$. In this respect, the setup we rely on works against finding a large Δ^*.

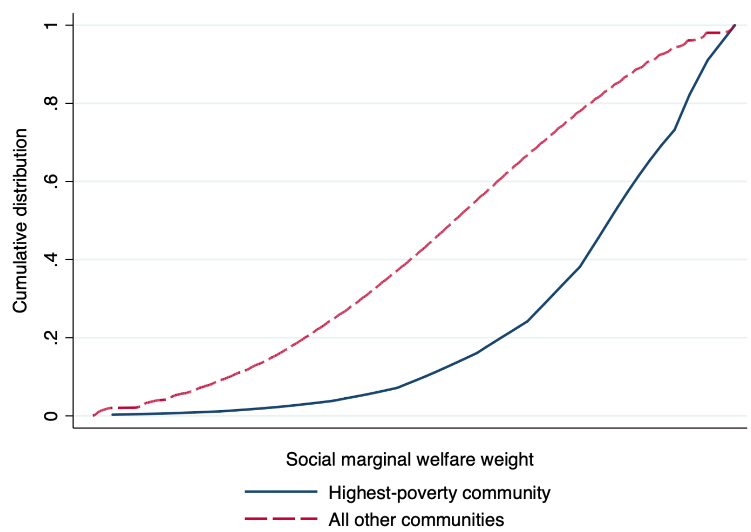
For computational simplicity, we restrict the social planner to a place-blind tax system $T(z)$ that has only three brackets with annual earnings thresholds at \$25,000 and \$100,000. That is, the planner chooses a universal lump-sum transfer $T(0)$ that everyone receives (i.e., a "universal basic income") and three marginal tax rates that prevail between earnings ranges $[0, 25,000)$, $[25,000, 100,000)$, and $[100,000, \infty)$.

Results 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.

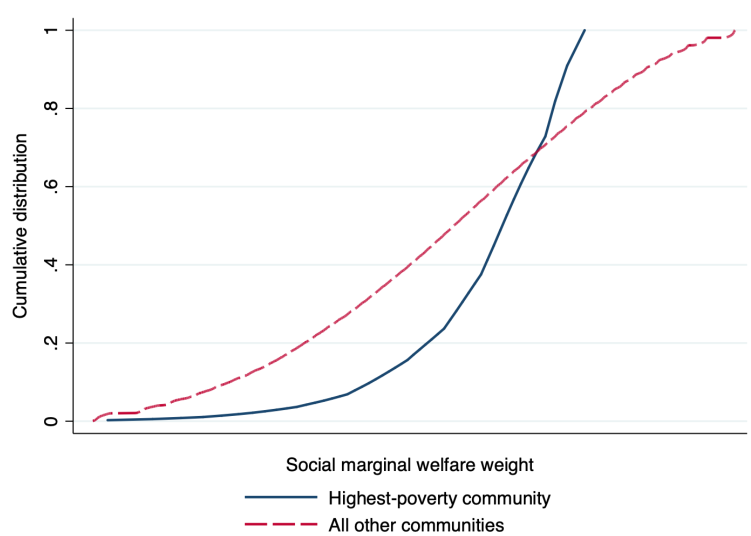
Figure 4 plots the distribution of social marginal welfare weights $\lambda^*(\Theta)$ in Distressed (the poorest community) and Elsewhere (the other ninety-nine communities) at zero PBR ($\Delta = 0$) and at the optimal PBR ($\Delta = \$5,400$), with the income tax chosen optimally in each case. Panel 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.

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

A. Social Marginal Welfare Weights with No Place-Based Redistribution ($\Delta = 0$)



B. Social Marginal Welfare Weights at Optimal Place-Based Redistribution ($\Delta^* = \$5,400$)



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.

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.[19] 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 shallower 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 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 \$100,000). 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. Hence, the planner must compute the optimal budget-neutral PBR scheme under the current place-blind income tax regime. Imposing this constraint raises Δ^* to \$6,750. Starting at a suboptimal place-blind income tax leaves a greater role for PBR

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

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.

8 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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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:

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

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:

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

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 $\Delta^*, \frac{dSWF}{d\Delta}(\Delta^*) = 0$. 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 $\bar{\Lambda}_j = \mathbb{E}\left[\Lambda(\cdot)\,|j^* = j\right]$, 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 (22)

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:

$$dz_j = \frac{-\left(\frac{\partial z^*}{\partial(1-\tau)} - \frac{\partial z^*}{\partial I} z^*\right)\mathring{T}'(z^*)\,dq - \frac{\partial z^*}{\partial I}\mathring{T}\left(z_j^\theta\right)dq}{1 + \left(\frac{\partial z^*}{\partial(1-\tau)} - \frac{\partial z^*}{\partial I} z^*\right)T''(z^*)}, \tag{18}$$

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:

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

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 :

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

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 (18) 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:

$$\frac{dW}{d\Delta}|_{\Delta=0} = \bar{\lambda}_1 - \bar{\lambda}_0 + \frac{dS}{d\Delta}\left(\frac{r_0}{\gamma_0}\bar{\lambda}_0 - \frac{r_1}{\gamma_1}\bar{\lambda}_1\right). \tag{19}$$

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:*

$$\frac{dSWF}{d\Delta}(0) = \bar{\lambda}_1 - \bar{\lambda}_0 + \frac{\partial S}{\partial \Delta}\left(\frac{r_0}{\gamma_0}\left(\bar{\lambda}_0 - \bar{\Gamma}_0\right) - \frac{r1}{\gamma_1}\left(\bar{\lambda}_1 - \bar{\Gamma}_1\right)\right) + \mathbb{E}_\theta\left\{\frac{dS^\theta(0)}{d\Delta}\left[T\left(z_1^\theta\right) - T\left(z_0^\theta\right)\right]\right\} \tag{20}$$

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:

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

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:

$$\frac{dSWF}{d\Delta} = \bar{\lambda}_1 - \bar{\lambda}_0 + \frac{dS}{d\Delta} \mathbb{E}\left\{ [T(z_1^*(.,0)) - T(z_0^*(.,0))]\,|move \right\} \quad (21)$$

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

$$\frac{dB}{d\Delta} - \frac{dB}{dq} = \lim_{\Delta \to 0} \int_{\Theta \in \mathbb{R}^4} \left[\frac{j^*(\Theta, \Delta) - j^*(\Theta, 0)}{\Delta} \left(\left[T\left(z_1^*(\Theta, 0)\right) - T\left(z_0^*(\Theta, 0)\right) \right] \right) \right] dF(\Theta) \tag{22}$$
$$- \lim_{q \to 0} \int_{\Theta \in \mathbb{R}^4} \left[\frac{j^*(\Theta, q) - j^*(\Theta, 0)}{q} \left(\left[T\left(z_1^*(\Theta, 0)\right) - T\left(z_0^*(\Theta, 0)\right) \right] \right) \right] dF(\Theta)$$
$$- \mathbb{E}\left\{ T'(z^*) \frac{\rho'(z^*)}{S(1-S)} \frac{Z_{1-\tau}}{1 + Z_{1-\tau} T''(z^*)} \right\}$$

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.

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 (conditional on 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.

Example Consider a simple utility function:

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

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

$$\varepsilon_1 - \varepsilon_0 > \frac{z_0(\theta)}{P_0} - \frac{z_1(\theta)}{P_1}. \tag{23}$$

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[20] 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

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

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.

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