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SHOULD TRANSFER PAYMENTS BE INDEXED TO LOCAL PRICE LEVELS?

Edward L. Glaeser

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> To act as if living costs do not matter, or as if financially strapped states will pick up where Washington leaves off, amounts to a vicious attack on the poor who happen to live in high-cost states.
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> *New York Times* Editorial, August 5, 1994

I. Introduction

The 1993 *Poverty Data Correction Act* aimed to expand the definition of poverty for the residents of high cost states, with the aim of increasing transfer payments to the poor in high cost areas. The New York Times seems to think that a more generous welfare policy towards residents of high cost states is natural, and the absence of such a policy represents "viciousness." Indeed it does seem to be common sense to correct welfare payments for local prices.[1] Few economists argue against indexing benefit levels to annual changes in the consumer price index. Why not correct spatial price differences to spatial price differences?

This paper attempts to set forth the basic economics of an optimal transfer policy over space when there are local price differences. I assume that the government's objective is to maximize the welfare of transfer recipients.[2] The framework is meant to handle any situation when the government is distributing cash benefits across space, for example AFDC and social security payments and even some governmental pensions.

The economics of spatial price differences are very different from the economics of temporal price differences. Since at least some individuals are able to move across space, we usually believe that higher prices reflect either higher wages or higher amenities. Basic spatial economics tells us that agents in high cost cities have simply chosen to receive the benefits of those cities

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[1]The inclination to correct for local price levels is strong among economists as well as journalists. Ladd and Doolittle (1982), who argue that transfer recipients are highly mobile, also take it as a matter of course that optimal central government policy will correct for local price differences.

[2]If government transfers are made because the wealthy don't like having poor neighbors and particularly wealthy people are particularly opposed to having poor neighbors (i.e. the desire to avoid poverty is a normal good) and high cost areas have more particularly wealthy people, then optimal government policy would give bigger transfers in higher cost areas, not to help the poor but to help the rich who live in those areas.

and to pay those costs. Following this reasoning, channeling transfers to high cost areas is not in any sense more equitable than giving extra money to people who have less remaining income because they decided to buy expensive cars.

Furthermore, as Kaplow (1995) has stressed, transfers to high cost areas will be in a sense less efficient. A one dollar payment to an individual living in a high cost area buys less goods than a one dollar transfer to an individual in a low cost area.[3] Giving 100 dollars to welfare recipients in Arkansas will have more of an impact on their well being than giving 100 dollars to welfare recipients in New York City. This force drives us towards negative indexing and focusing transfers away from high cost areas.

A third point (that is stressed repeatedly in the fiscal federalism literature) is that when migration responds to transfers then having higher transfers in one area will only set off a wave of in migration which will result in lower wages and higher prices. For any spatial differences to make sense, there must be some limits on migration. Migration will continue until higher housing costs of high transfer areas undo the benefits created by those transfers; people living in high cost areas who have received the extra transfers will not eventually be any better off than people living in low cost areas. Higher levels of transfers in high cost areas will also lead to social costs stemming from the distortion of the migration decision.[4]

The main point of this paper is that the focus on spatial equity is misplaced, not only because migration ensures a certain degree of equality over space, but also because the goal of a location-based transfer program should not be to equalize total utilities. The reason for spatial differences in transfer payments

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[3]Kaplow (1995) is the primary predecessor of this paper in this question. Several of the major points of this paper have been made by Kaplow and while our papers were written independently, his paper was circulated earlier and deserves first credit for several of the ideas in this paper. While Kaplow is extremely insightful and deals with a broader set of conditions that I do, he does not formalize the problem or come up with a closed form solution for the connection between local prices and transfers. The formalization of the problem should be seen as the major contribution of this paper.

[4]A rarely made point is that migration serves as a check on negative indexing as well as on positive indexing. Thus if negative indexing is appropriate (because of the efficiency argument made in the previous paragraph), then mobility also limits the optimality of negative indexing.

is to equalize the marginal utility of income across space.[5] With this point in mind, the crucial issue in spatial indexing is what the higher prices are reflecting about the local environment. When higher prices reflect higher wages for the transfer recipients, then there is little reason to index. When higher prices reflect positive amenities, then the government must ask whether these amenities are substitutes or complements for consumption of all other commodities. (I generally refer to the composite commodity as income for simplicity.)

If amenities are close substitutes for income (i.e. the composite commodity), then the marginal utility of income in high cost areas will be close to the marginal utility of income in low cost areas, because people in high cost areas will have lower real incomes but higher amenities and the two effects on the marginal utility of income offset one another. If amenities and income enter independently in the utility function, then the marginal utility of income will be higher in high cost areas since people have less real income. If amenities and income are complements then the marginal utility of income will be higher in high cost areas, not just because people have less real income but also because the amenities are increasing the marginal utility of income in those areas.

In the model, I show that the optimal connection between transfers and local prices depends on the coefficient of relative risk aversion, the mobility of labor, and the extent to which income and amenities are complements or substitutes. The model also leads to a convenient formula which can be used to calculate the optimal connection between transfer payments and local prices given these parameters. Indexing becomes larger as the coefficient of relative risk aversion rises or when mobility falls or when amenities and income are complements in consumption. Some policy implications of the theoretical section are that economic welfare is increased if price corrections are targeted away highly mobile transfer populations (such as young, single males) and targeted towards more immobile populations (single mothers with large families, or the elderly over 70). Welfare is also increased if extra

[5]Bergstrom (1986) has particularly emphasized this point and focused on the role of government in equalizing marginal, rather than total, utilities, and my thinking on this topic is deeply indebted to his work.

transfer payments are given to high cost areas only when transfer recipients in those high cost areas are not receiving cash-like benefits (such as access to better formal or informal labor markets) from living high cost areas. Positive indexing raises welfare more if this indexing occurs for individuals who are highly risk averse (perhaps the extremely poor with children) and indexing raises welfare less for individuals with lower coefficients of relative risk aversion.

In a base calibration, I use an estimate of 2 for the coefficient of relative risk aversion. I use an elasticity of mobility with respect to income of 1 (i.e. a 10% increase in income causes a 10% increase in recipient population). Both of these estimates are well within the range of plausible empirical estimates of these parameters. The substitutability between income and amenity levels is less well known. I take as a benchmark the assumption that income and amenities enter into the utility function independently. Under these assumptions, a 1% increase in prices leads to a .33% increase in transfers relate to total income (i.e. Change in Transfers/Initial Total Income). Thus, when transfers are 67% of income, a 1% increase in transfers leads to a .5% increase in total income. Figure 1 shows that these results are reasonably robust.

A preliminary examination of the data suggests that both AFDC eligibility levels, maximum benefit levels, and average benefit levels (benefits include food stamps) move sharply with local prices in practice. Indexing in practice is at a higher than 150% level in most cases. While these results are highly preliminary and need further investigation, indexing over than 150% cannot be justified for any parameter values and suggests that the country needs is sharper indexing. This paper suggests that social welfare would rise if government policy decreased the extent to which transfers are implicitly indexed.

II. Model

The model is split into a preliminary model and a complete model. The first two sections deal with a preliminary model where the government does not internalize the effects of its actions on individual mobility. In the first section, I present optimal transfer policy; in the second section I present optimal indexing of eligibility rules. The third and fourth sections present the model incorporating a mobility response. The final section presents the policy implications of the theory.

1. Transfers across space with no mobility response

This model formalizes our thinking on government transfers across space. The central planner in this model is allocating a fixed sum of transfers (denoted F) across a number of locations.[6] Each location is indexed with a number, i, on the real line. All of our transfer recipients are assumed to be identical except for attributes which are a function of their location.

Transfer recipients are (in this preliminary version of the model) unable to move to respond to welfare payments. I assume that agents receive utility from income which equals transfers plus labor income, which is denoted $W_i(N_i)$ with $W_i'(N_i) \leq 0$, because $W_i(N_i)$ represents an inverse labor demand curve for local labor. There is also a local price levels which includes housing and other costs, which I denote $P_i(N_i)$, and I assume that for marginal changes $P_i'(N_i) \geq 0$, so costs rises with local area population.[7]

Agents also receive utility from a location specific amenity which is denoted A_i and is assumed to be independent of population.[8] Amenities are meant to include everything from ocean views to quality schooling. The only things that it does not include are attributes of the locality that differences in income

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[6]Alternatively I could assume that government finances are raised at some cost. If these funds are raised nationally, little would change in the basic equation; a marginal cost term would simply replace the budget set multiplier. If they were raised locally, so different areas have different costs and these local funds were used for local transfers (as they often are in practice) then the results could change dramatically. Since areas with high marginal utilities of income for transfer recipients will often have high marginal utilities of income for the taxable population, the cost of transfers will be higher in high cost areas and indexing should be less appealling. Alternatively, if high cost areas were wealthier than indexing should rise.

[7]While agglomeration economies play an important role in explaining city formation, and these agglomeration economies might suggest that over some regions prices are falling with increased city population, for city sizes to be locally stable it must be true that for marginal changes increases in population decrease the utility of the marginal migrant presumably by depressing wages and raising prices.

[8]Allowing amenities to be a function of local area population would be a quite reasonable extension of the model. Little would change in the basic results, but the congestion terms would now include the effects of lower wages, higher prices and lower amenities.

itself, e.g. higher local wages or higher local taxes. For the purposes of the model, I can smooth over issues about what amenities actually are important, but for implementation it becomes much more important to figure out what these amenities are and most importantly whether they are complements or substitutes to income. Amenities are exogenous and fixed in this model, and prices or wages (or both) will adjust to create a spatial equilibrium. The assumptions on wages declining and prices rising with population guarantee a spatial equilibrium where higher amenities attract more people who eventually drive down wages and drive up local prices.

I can operationalize the central planner's possible taste for equality by assuming that the planner choose transfer payments to maximize the integral of a concave function (G(.)) of utilities over all consumers:

$$\int_i G\left(U\left(\frac{W_i(N_i)+T_i}{P_i}, A_i\right)\right) N_i di \tag{2.1}$$

subject to a fixed budget constraint:

$$F \geq \int_i T_i N_i di \tag{2.2}$$

When mobility does not respond to changes in transfer payments, the first order condition for this problem (for each location) is:

$$\frac{U_{iI}}{P_i} G'(U_i) = \lambda, \tag{2.3}$$

For notational convenience, U_i denotes the total utility level in location i and U_{iI} denotes the marginal utility of income in location i. This unsurprising condition tells us that optimally transfers should be given to equalize the marginal utility of income over space. If we are looking at a spatial equilibrium where utilities are equalized over space (as we will generally be doing), then U_i is a constant and $G'(U_i)$ can be dropped from the equation, so no matter how much the social planner cares about equity our basic results will be unaffected.[9] From here on, I will drop the $G'(U_i)$ term for clarity.

Total differentiation of (2.3) shows:

$$\frac{dT}{W+T}=\frac{dP}{P}\frac{\sigma-1}{\sigma}-\frac{dW}{W+T}-\frac{P}{W+T}\frac{U_{IA}}{U_{II}}dA, \tag{2.4}$$

where U_{II} is the second derivative of utility with respect to income and U_{IA} is the cross derivative of the utility function between income and the amenity, and where $\sigma=-\frac{W+T}{P}\frac{U_{II}}{U_I}$, the coefficient of relative risk aversion. Equation (2.4) immediately tells us that if we choose to believe (counterfactually, see the extensive cost of living literature, e.g. Roback, 1982, Rauch, 1993) that prices are randomly distributed across space, and to believe that amenities and wages are either constant over space or uncorrelated with local price levels, then on average transfers (as a fraction of total income) should rise $(\sigma-1)/\sigma$ percent if prices rise by 1 percent. If, for example, the coefficient of relative risk aversion was two, then transfers (again as a share of total income) should rise by 50% if prices rise by 100%.

A more reasonable alternative to the assumption that prices are randomly distributed across space is that the initial distribution of population is determined by free migration so that utilities are (before transfers) equal across locations:[10]

$$U(\frac{W_i(N_i)}{P_i},A_i)=U(\frac{W_j(N_j)}{P_j},A_j)=\underline{U} \tag{2.5a}$$

where $\underline{U}$ is the reservation utility across locations. Total differentiation of (2.1.5a) gives us the following relationship:

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[9]This statement is not true for the results in the next section and in that section, I will discuss the relevance of equity issues in eligibility cutoffs.

[10]It is slightly problematic to assume that population has adjusted perfectly to spatial differences in wages, amenities and prices before the transfer program, but does not adjust at after the transfer program. One possible justification is that the wage, price and amenity differences are seen as being permanent but that the transfers represent a temporary shift.

$$-\frac{U_I}{U_A}\left(\frac{dW}{P}-\frac{WdP}{P^2}\right)=dA \tag{2.6a}$$

Higher amenities are reflected in both lower amenities and higher prices. Inserting (2.6), into (2.4), and using the notation $\Omega=\frac{U_I U_{IA}}{U_A U_{II}}$ yields:

$$\frac{dT}{W+T}=\frac{dP}{P}\left(1-\frac{1}{\sigma}-\Omega\frac{W}{W+T}\right)-\frac{dW}{W+T}(1-\Omega), \tag{2.7a}$$

A second possible assumption on the spatial equilibrium, which is also problematic, is that individuals are in a spatial equilibrium after the transfers have been made. However, since I assume that the central planner does not take mobility into account when determining transfers, there is again a slight incongruity.[11] When we make this assumption the new spatial equilibrium is:

$$U\left(\frac{W_i(N_i)+T_i}{P_i},A_i\right)=U\left(\frac{W_j(N_j)+T_i}{P_j},A_j\right)=\underline{U} \tag{2.5b}$$

and total differentiation of (2.5b) gives us the following relationship:

$$-\frac{U_I}{U_A}\left(\frac{dW+dT}{P}-\frac{(W+T)dP}{P^2}\right)=dA \tag{2.6b}$$

Substituting, (2.6b) into (2.3) yields:

$$\frac{dT}{W+T}=\frac{1-\Omega-\frac{1}{\sigma}}{1-\Omega}\frac{dP}{P}-\frac{dW}{W+T}, \tag{2.7b}$$

The first conclusions from either (2.7a) or (2.7b) is that if higher prices are being offset by higher wages, then there is less reason to consider indexing transfers to local prices. If we assume that a group of individuals with either

[11]By making this assumption here and by comparing the results from this section with the results in section (4), I can compare the effects of this definition of the spatial equilibrium and the effects of incorporating migration effects into the planner's problem.

no income, or negligible differences of wages across space (i.e. $dW=0$), then the basic indexing problem comes down to three parameters: the coefficient of relative risk aversion, the share of total income that is transfers and Ω, a term showing the extent to which amenities are complements or substitutes to income.

When the coefficient of relative risk aversion is higher, then indexing makes more sense. The intuition behind this result is that higher prices have both a price effect and an income effect. The price effect means that high prices decrease the marginal efficacy of money spent in the area (e.g. a dollar given to a welfare recipient in New York will be less than a dollar given in Arkansas). The income effect means that higher prices (as long as they are not totally compensated for by higher wages) will tend to reduce real income and increase the marginal utility of income. The coefficient of relative risk aversion tells us how big the effect on the marginal utility of income is relative to the effect on decreased efficacy of dollars spent, where a higher coefficient of relative risk aversion means a more concave utility function and that people in high cost areas really value dollars more.

The Ω term captures the extent to which income and amenities are perfect complements or substitutes. In either (2.7a) or (2.7b), higher levels of Ω, which means a greater tendency for income and amenities to be substitutes not complements, are associated with lower levels of indexing. The intuition of this result is that what really matters are the differences across space in the marginal utility of income, not differences across space in the total utility level. Since lower real earnings are associated with higher level of amenities (in either spatial equilibrium), the key question is whether the marginal utility of income is higher in those communities with higher amenities and lower earnings. When amenities and income are close substitutes, then the marginal utility of income should be the same in high amenity--high price areas and low-amenity--low price areas. When amenities and income are independent or complements, then the marginal utility of income will be much higher in high amenity--high price areas than in low amenity--low price areas.

2. *Eligibility Rules*

The previous section has dealt with the optimal transfer numbers given that a fixed quantity of funds needs to be allocated to a homogenous population. Alternatively, I can present a situation where the government gives away a fixed quantity of benefits per person (denoted f) and has to choose which citizens will receive this benefits. Here I assume that there are heterogeneous wages in each locale, and heterogeneous human capital levels (denoted α with associated local wages of $W_i(\alpha)$). The government is setting the eligibility rule in each location. The government's maximization involves choosing eligibility cutoffs for each location (denoted $\underline{W_i}$) and the government maximizes the sum of total possible recipient utilities:[12]

$$\int_i \left[\int_{W \le \underline{W_i}} U\left(\frac{W+f}{P_i}, A_i\right) N_i(W)dW + \int_{W \ge \underline{W_i}} U\left(\frac{W}{P_i}, A_i\right) N_i(W)dW \right] di \qquad (2.8)$$

subject to $F \ge f \int_i \int_{W \le \underline{W_i}} N_i(W)dWdi$. Assuming that eligibility is greater than zero and less than 100% in all areas, the first order condition is:

$$U\left(\frac{\underline{W_i}+f}{P_i}, A_i\right) - U\left(\frac{\underline{W_i}}{P_i}, A_i\right) = \lambda f \qquad (2.9)$$

By standard arguments, for arbitrarily small levels equation (2.9) implies that $\frac{U_I}{P} \approx \lambda$, so the optimal eligibility rule for small enough transfers is basically equivalent to the optimal rule for distributing transfers over space.

The spatial equilibrium becomes somewhat more difficult in this case since individuals are heterogeneous. For simplicity, I will assume that all amenity differences are being reflected in different prices (i.e. wages are not changing) and that the equilibrium is fixed before transfers occur. These assumptions imply that $\frac{U_I}{U_A}\frac{dP\underline{W}}{P^2} = dA$, and using that equality differentiation shows that:

[12]Here the decision to drop the G(.) terms is important.

$$\frac{d\underline{W}}{\underline{W}}=\frac{dP}{P}\left(1-f\frac{U_I^{+f}}{U_I-U_I^{+f}}\right)-\frac{P}{\underline{W}}\frac{U_A-U_A^{+f}}{U_I-U_I^{+f}}dA=\frac{dP}{P}\left(1-\frac{U_I}{U_A}\frac{U_A-U_A^{+f}}{U_I-U_I^{+f}}\right) \quad (2.10)$$

This term is very similar in several respects to the term in (2.7a). In the formula, eligibility should be indexed to local price difference if amenities and income enter completely independently in the utility function. When income and amenities are perfect substitutes in the sense that U(I,A)=U(I+A) then no indexing should occur. While this situation is slightly different from the main problem discussed in this problem, as this section shows the basic price theory and the most relevant parameters are very similar. As a result, in the next section when we include mobility adjustments to government programs we will just focus on the primary problem of transfer indexing, not eligibility rules.

I have glossed over equity concerns in this section so far, and used an additive social welfare function. This lack of attention is less merited as I am dealing with heterogeneous labor. While space considerations prevent a full treatment of equity issues with heterogeneous labor, it is worth pointing out a simple alternative to the above indexing rule. If we assume that the planner's objective function is to give the transfer to the least happy members of society (as it would be under an extreme Rawlsian maximin function), and since each human capital level will be associated with a unique utility level (which is independent of location) then eligibility rule will be found by choosing the highest human capital level that can be accommodated given the budget constraint. If the planner could observe human capital levels directly then transfers should be made based on those levels. If the planner can only observe wages, then eligibility rules need to be based on wages and the planner is basically solving an inference problem trying to estimate latent utility from local wages.

The eligibility rule will just be found by looking at the wages that people with that highest human capital level (denoted $\underline{\alpha}$) earn in each location. In other, I can just differentiate $U(W_i(\underline{\alpha})/P_i, A_i)=\underline{U}$, to find a new eligibility rule

$$\frac{dW(\underline{\alpha})}{W(\underline{\alpha})}=\frac{dP}{P}-\frac{U_I P}{U_A W(\underline{\alpha})}dA. \quad (2.10')$$

While this rule is significant different from (2.10), it suggests that equity concerns might suggest a motive for indexing eligibility rules (but not indexing payments to homogeneous persons). The crucial issue is whether prices are adjusting for amenities that are valued by this income group. If amenities are not changing much over space in a way that is valued by this group, then adjustment should be strong. When amenities are changing, then adjustment makes little sense.

3. *Transfers across space with endogenous mobility*

In the previous section, I assumed that there would be no mobility response to higher transfers. In reality mobility does respond to different transfer levels, and the government should take that response into account. However, a reasonable treatment of mobility responses will allow for the fact that forces (location specific human capital, mobility costs, etc.) exist that limit the ability of transfer recipients to move in response to transfers. I assume that there are heterogeneous factors linking people to a single location. While there are a continuum of locations (measure J), I assume each person only considers two locales; everyone has two favorites that far outrank that others, and that idiosyncratic features are such that we only need consider for each person the comparison between these two areas.[13] For any two neighborhoods i and j there are exactly θ_{ij} individuals who are choosing between those two neighborhoods. Each person receives W(i, k) if he lives in the first neighborhood and W(j, k) if he lives in the second neighborhood.

I normalize and let V(k) denote W(i, k)-W(j, k). I allocate each individual's index number k so that individuals are uniformly distributed on k and V(k) is weakly descending with k.[14] I also assume that $\int_k W(j,k) = 0$, for any set of individuals who are indifferent between j and i. The term V(k) should be understood as containing moving costs and any other factors which limit

[13]Allowing individuals to choose between more than two neighborhoods adds almost nothing as for any parameter values an individual will always have a preferred locale and a second favorite.

[14]This uniform distribution involves no loss of generality since I have put no structure on V(.).

one's ability to leave a particular location.[15] Thus equilibrium will be found so that an individual denoted k* is indifferent between all locations i and j, and those with k≥k* will choose location j. I also assume that $\int_k W(j,k)=0$, for any set of individuals who are indifferent between j and i, so that $\int_{k<k^*} W(i,k)+\int_{k\geq k^*} W(j,k)=\int_{k<k^*} V(k)$. The locational equilibrium is described by the following equality:

$$U\left(\frac{W_i(N_i)+T_i}{P_i(N_i)},A_i\right)+V_{ij}(k^*)=U\left(\frac{W_j(N_j)+T_j}{P_j(N_j)},A_j\right) \tag{2.11}$$

For notational ease we will denote $\Psi_i \equiv N_i U_{il}\frac{P_i W_i'(N_i)-(W_i+T_i)P_i'(N_i)}{P_i^2}$. Using condition (2.11), the fact that $N=\int_{j\neq i}\theta_{ij}k_{ij}^* dj$, and by using the fact that a change in the population level of one area will have only an infinitesimal change on the population level of all other areas:

$$\frac{\partial N_i}{\partial T_i}=-\frac{\frac{U_{il}}{P_i}\int_{j\neq i}\frac{\theta_{ij}}{V_{ij}'(k^*)}}{1+\frac{\Psi_i}{N_i}\int_{j\neq i}\frac{\theta_{ij}}{V_{ij}'(k^*)}dj} \tag{2.12}$$

The important fact is that V'(.) determines the level to which labor responds to changes in the transfer level. When V'(.) is close to zero, so individuals are almost indifferent between neighborhoods, then a slight change in transfers will precipitate a significant labor supply response. When V'(.) gets extremely large then transfer differences will create almost no labor supply response. The planner's problem is to maximize:

$$\int_i\left[N_i U\left(\frac{W_i(N_i)+T_i}{P_i(N_i)},A_i\right)+\int_{j\neq i}\theta_{ij}\int_{k=0}^{k_{ij}^*}V_{ij}(k)dkdj\right]di \tag{2.13}$$

[15]Moving costs will end up playing a small role in these results, and will end up working only through the migration elasticity. One reason for this fact is that these costs are assumed to be entirely private and are only undertaken if private benefits exceed private costs.

subject to the budget constraint, equation (2.2). Differentiating with respect to transfers and using the equality (2.11), the first order condition from this problem is:[16]

$$\frac{U_{iI}}{P_i} - \lambda = \frac{1}{N_i}\left[\lambda T_i \frac{\partial N_i}{\partial T_i} - \lambda \int_i T_j \theta_{ij} \frac{\partial k_{ij}^*}{\partial T_i} - \Psi_i \frac{\partial N_i}{\partial T_i} + \int_{j \neq i} \Psi_j \theta_{ij} \frac{\partial k_{ij}^*}{\partial T_i}\right] \tag{2.14}$$

This term basically shows that when mobility is zero (i.e. $\partial N/\partial T=0$) then the first order condition is that same as above. However, when mobility is not zero there is a wedge between the marginal value of a transfer to the recipient to the marginal cost to the government and that wedge represents the welfare losses associated with distorting the migration decision (or the welfare gains associated with fixing existing distortions). If a region is particularly high transfer, transfers to that area have a particular social cost which comes from the fact that any new migrants cost society because they will require more transfers. This is a force that pushes transfer differences across space down to zero.

The Ψ terms represent the fact that it is "socially" desirable to induce migration away from areas where wages and prices are highly population elastic to areas where wages are highly inelastic. This term incorporates the negative effects of any distortions that transfer policy creates to the local labor market. A somewhat odd feature of this term and the problem as I set it up is that one goal of policy is to maximize the wages received by the welfare recipients and maximizing wages suggests that the government should play some role inducing migration to maximize wages.[17] Even without this feature of the problem, this term would remain and continue to reflect any

[16] I am also assuming that a change in transfers in neighborhood i does not effect the locational distribution of populations that are choosing between any two other neighborhoods (j and l not i), i.e. that $\partial k_{jl}^*/\partial t_i=0$. This assumption may be problematic for large shifts in locational transfers.

[17] If the government itself was taxing firm profits, and it incorporated the benefits to firms, then this conclusion would be far less stark. Likewise, while this model says that it is socially desirable to try and induce lower prices for everyone, if those prices are to a large extent housing prices and the government internalizes the gains to landowners, then this effect will weaken.

distortions to the labor and housing markets that are created by transfer differences across space.

4. Assumptions to improve tractability

Under the condition that changes in the population of location i effect the population of each other location j equally, $\theta_{ij}\frac{\partial k_{ij}^*}{\partial T_i}=\frac{1}{J}\frac{\partial N_i}{\partial T_i}$, and using the notational convention that $\varepsilon_{iI}^N=\frac{W_i+T_i}{N_i}\frac{\partial N_i}{\partial T_i}$, equation (2.14) can be rewritten:

$$(W_i+T_i)\left(\frac{U_{iI}}{P_i}-\lambda\right)=\varepsilon_{iI}^N\left(\lambda(T_i-\hat{T})-(\Psi_i-\hat{\Psi})\right) \quad (2.14')$$

where I use the convention that $\hat{X}=\int_j X_j dj / J$ for any variable X. I now further assume that the elasticity of migration with respect to real income is constant over space. Now total differentiation reveals:

$$\begin{aligned}&(dW+dT)\left(\frac{U_I}{P}-\lambda\right)-(W+T)\frac{U_I dP}{P^2}+(W+T)\frac{U_{II}}{P}\left(\frac{dW+dT}{P}-dP\frac{W+T}{P^2}\right)\\&+(W+T)\frac{U_{IA}}{P}dA=\varepsilon_I^N(\lambda dT-d\Psi)\end{aligned} \quad (2.15)$$

I will also assume that despite the presence of some individual level heterogeneity, that we are basically at a standard locational equilibrium after the transfers where:

$$U\left(\frac{W_i+T_i}{P_i},A_i\right)+V(k_{ij}^*)=\underline{U}+V(k_{ij}^*), \quad (2.16)$$

for all subgroups, so that raw utility levels are equalized over space which implies:

$$dA=\left(\frac{dP}{P}-\frac{dW+dT}{W+T}\right)\frac{U_I}{U_A}\frac{W+T}{P}. \quad (2.17)$$

For simplification purposes, at this point, I will assume that on average $\frac{U_I}{P} \approx \lambda$. On some level this must be true since the deviations from this equality hold only when transfers or congestion are above or below the national average, so on average this should hold. Since the goal is to find a common relationship between transfers and prices that should hold uniformly across the country, eliminating these locational idiosyncrasies is extremely helpful. With this equation and using the same notation introduced above:

$$\frac{dT}{W+T} = \frac{1-\Omega-\frac{1}{\sigma}}{1-\Omega+\frac{\varepsilon_I^N}{\sigma}}\frac{dP}{P} - \frac{1-\Omega}{1-\Omega+\frac{\varepsilon_I^N}{\sigma}}\frac{dW}{W+T} + d\Psi\frac{\varepsilon_I^N}{\left(1-\Omega+\frac{\varepsilon_I^N}{\sigma}\right)\frac{W+T}{P}\sigma U_I} \qquad (2.18)$$

In the case that the elasticity of migration equals zero, equation (2.18) collapses to equation (2.7b). In general this term is saying the first equation is saying that higher transfer levels should move with local prices, but also with changes in local wages and changes in the "congestion" effects. Bringing workers into areas where they will significantly lower wages or raises prices, out of areas where there presence made little difference to local income or costs is inefficient.

This term will be the term used in the policy analysis discussion that follows. However, as this term is still somewhat cumbersome, for the purposes of the calibration exercise, I will assume that wages (for the recipient group) congestion costs differ little across locations and discuss solely the term $\left(1-\Omega-\frac{1}{\sigma}\right)\Big/\left(1-\Omega+\frac{\varepsilon_I^N}{\sigma}\right)$ which is the connection between transfers and prices under those conditions. One basic implication of this term is that a greater mobility elasticity should lower the connection between transfers and prices, (i.e. make the connection closer to zero). Higher mobility responses make interregional differences in transfers less efficient because people move to the high transfer area.

Again when the coefficient of relative risk aversion rises, the connection between transfers and local prices should get more positive. As amenities and income become better substitutes (i.e. Ω rises), then the connection between transfers and local prices falls. When amenities and income are complements that transfers should be much higher in high price areas.

5. Policy implications of the theory

While, the numerical policy implication of this paper (the connection between transfer levels and local prices) must wait until I have parametrized $\left(1-\Omega-\frac{1}{\sigma}\right)\Big/\left(1-\Omega+\frac{\varepsilon_I^N}{\sigma}\right)$, there are several immediate policy implications that come from these comparative statics. Transfers should correct for local prices among immobile populations than among mobile populations. From the large migration literature, we know what personal attributes are correlated with mobility and we can use this knowledge to rule out immediately certain groups from receiving local price corrections for transfers.

In particular, the migration literature tells us that mobility is (1) particularly high among the young and (2) particularly high among the elderly at age 65. Mobility substantially declines among middle aged individuals, particularly those with children. As a result, when designing transfer programs, it is more important to keep transfer levels constant across space for those mobile populations. AFDC payments to families with multiple children are facing a less mobile population and can therefore take more latitude in allowing transfer levels to change over space.

In addition, when it is possible to determine the sources of local price effects, then this knowledge can also help guide governmental transfer policies. When local prices are the result of (1) amenities that are complements for income or (2) temporary, local price effects, then compensation for a portion of local price effects may be reasonable. When local prices represent amenities that are strong substitutes for income, or if these prices are a compensating differential for a strong local labor market which the transfer recipients benefit from, then compensating the residents of high cost regions will be less optimal. The exact nature of amenities determines the extent to which they are substitutes or complements for income, and that in turn determines the optimality of indexing.

Finally, the degree to which agents are risk averse also determines the optimality of indexing. When individuals are extremely risk averse, so the income effect where higher prices lowers real income is more important than the price effect where higher prices makes transfers less effective, then transfers should be positively indexed to local prices. If the particularly poor are more risk averse, then indexing is more appropriate for transfers to those in extreme deprivation. When populations are less risk averse, then positive indexing is inappropriate and indeed for some reasonable parameter values it makes sense to negatively index when individuals have a coefficient of relative risk aversion around or less than one. An possible implication is that while positive indexing may make sense for AFDC payments, it may make little sense among less risk averse recipients of social security payments.

III. A Calibration and Comparison with Reality

The equation (2.18) gave us four parameters to estimate: σ, Ω and ε_l^N. Two of these parameters are quite often estimated and therefore I can come up with reasonable ranges for these estimates quite simply. My estimate of Ω is much more preliminary and should be taken as a first trial in this area.

Estimates of σ

There is a large literature presenting empirical estimates of the coefficient of relative risk aversion. While there are some estimates that seem extremely large (i.e. the estimates needed to resolve the equity premium puzzle, see Mehra and Prescott, 1985)), must reasonable estimates lie between 1 and 10. Early work in this area tended to find relatively low coefficients of relative risk aversion. Hansen and Singleton (1983) find coefficients close to one from looking at the connection between consumption and interest rates.[18] Experimental evidence from Barsky, Kimball, Juster and Shapiro (1995) that on average coefficients of relative risk aversion are close to 4.[19]

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[18] Cochrane and Hansen (1992) discuss a wide range of estimates and suggest that a staggering range of estimates are needed to make sense of the existing finance puzzles.
[19] My discussion of the literature on this topic is based on their work.

Given the range of estimates, in Figure 1, I use values of 1, 2, 4, and 10. My best estimate based on the existing literature and non-scientific polling of finance economists is 2, but it could quite plausibly be 1 or 4 as well. The estimates of 10 seem to be a reasonable upper bound.

The Mobility of Population -- ε_I^N

There is an extremely extensive literature on estimating the relationship between increases in local income levels and the rise in local population. The most relevant literature for our question are the examinations of population mobility based on the movement of welfare recipients. Current literature seems to have failed to come to anything like a clear consensus (see Moffitt, 1992 or Walker, 1994). The ranges of parameter estimates plausibly range from zero to two.

This earlier fiscal federalism literature is summarized by Brown and Oates (1987), who attest that the consensus seems to be the population moves rapidly in response to transfer level differences. Gramlich and Laren (1984) estimate a long run elasticity of the number of AFDC recipients with respect to AFDC payments of 1. Southwick (1981) comes to a somewhat different conclusion, generally using less information and finds an elasticity of in-migration of between 2.5 with respect to the maximum benefit level (which since in his data approximately 50% of AFDC recipients are migrants means an elasticity of total recipient population with respect to benefit levels of 1.25). These numbers must then be adjusted by the ratio of total income to AFDC payments to find the elasticity of transfer recipient population with respect to total recipient income. If AFDC payments represent 50% of family income for transfer recipients, the correct elasticity would range from 2 to 2.5.[20] Peterson and Rom (1989) find significant migration effects. Feldstein and Vaillant (1994) also provide evidence suggesting that migration (or other forces) is extremely effective at undoing attempts at local redistribution.

[20]The correct ratio is not the ratio of welfare payments to total income at a particular point in time, but rather the ratio of welfare payments to total income, discounted, over the total period after migration in the new community. As such, this figure is difficult to estimate without considerable research, and 50% seems like a roughly correct upper bound on the total share of income provided by AFDC payments.

A second literature which is less oriented towards fiscal federalism and more oriented towards the behavior of welfare recipients estimates much lower migration elasticities. Walker (1994) uses county level net migration and finds little evidence for any migration effect of local transfers. Blank (1988) use micro-data and looks at out-migration decisions of female headed households and finds considerable sensitivity to welfare differences across space. Her out-migration elasticities seem to range from the rough area of .1 (for New York City) to as high as .5 (for the Texas area).[21] If in-migration effects are as large as out-migration effects (and for many reasons in-migration effects might be much larger), then her elasticity estimates range from zero to one. Clark (1990) also finds evidence that out migration rates from areas with lower benefit levels are higher.

If the transfer recipients basically resemble the population on large in the degree to which their migration responds to income differences, then we can also use the broader migration literature for evidence on elasticities. Blanchard and Katz (1992) estimates parameters that are compatible with an elasticity of population with respect to income of 2. These authors find that negative shocks that create a 1% decline in income (after six years) create a greater than 2% decline in employment (which is, after six years, almost completely out-migration). A related piece of evidence is provided by Cebula (1979) who confirms that migrants respond strong to cost-of-living differences over space. Cebula (1979) also shows evidence suggesting that migration rates are a function of expected income growth.

For my parameter estimates of this elasticity, we will use values between 0 and 2, which is a huge range and basically includes the entire disparate literature. For my best estimates, I will use an elasticity of one, but it is quite clear, that there is not yet a consensus that would support this number or any other number. Further work pinning down this elasticity and recognizing that this elasticity may differ greatly across transfer recipient groups would be tremendously important and helpful for this exercise (and for many other purposes).

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[21]She generates out-migration elasticities with respect to dollar changes in monthly welfare benefits. I assumed that average income was $ 450 for both New York and Texas residents, since $ 450 was approximately the average total income for her sample.

The Substitutability of Income and Amenities -- Ω

Estimating the substitutability of income and amenities is a far more difficult topic than we can possibly handle here. Recent evidence by DiPasquale and Kahn (1996) estimates the demand for local amenities based on income. DiPasquale and Kahn estimate demand only within the Los Angeles SMSA, so their exercise is not precisely analogous to amenity level choices between areas. However, the advantage of looking at demand within a single SMSA, as opposed to between SMSAs, is that income will be less likely to be a function of location choice.

These authors find substantial disparity between amenity levels acquired by African-Americans and whites, but they found a significantly positive (which would be expected even if amenities and all other goods enter independently in the utility function), but ultimately those authors found very small connections between income and amenity demand. Based on their results, I will calibrate Ω at 0. The idea that income and amenities are independent seems like a relevant benchmark, and for sensitivity analysis I will also use values of -.5 and .5, which represents a quite sizable range of values. Unfortunately, economics has not been provided a strong body of empirical work which could be used to calibrate Ω more convincingly.

How Should Transfers Change with Local Price Levels?

Figure 1 shows the outcome of calibrating using my ranges of parameter values. All these estimate assumes that wages are constant across space and that the so-called congestion effects are small. Figure 1 uses the formula $\left(1-\Omega-\frac{1}{\sigma}\right)\Big/\left(1-\Omega+\frac{\varepsilon_I^N}{\sigma}\right)$ from the previous section, which describes how much transfers as a share of total income should rise with a percentage increase in prices. The full range of estimates lie between -1 and .933. While this range seems extraordinarily large, a few simple restrictions can bring us down to a much reasonable range.

If we accept that the coefficient of relative risk aversion is between two and four, then the optimal connection between transfers and prices is between 0 and .83. If we further assume that amenities and income are not substitutes (i.e. they are either substitutes of complements), then the range falls to with .17 and .83. Finally, if we assume the mobility elasticity is between 0 and 1, the range is between .33 and .83, which is a relatively narrow range for a relative broad range of parameter values. Of course, by necessity these estimates are still a first attempt to pin down the optimal connection between prices and transfers.

For my best estimate, I will use an elasticity of migration of 1, a coefficient of relative risk aversion of 2, and assume that amenities and income are independent. Under these assumptions the connection between transfers and prices is .33. A final consideration is that we are determining the connection between dT/(W+T) and dP/P. Under some circumstances the term dT/T is easier to interpret. In that case, we should just multiply the elasticities in Figure 1 by the ration (W+T)/T. In cases where transfers are all, or a large share, of total transfers then (by my best estimates), transfers 33% and 67% as much as price changes. When transfers are 50% of income, then optimal indexing is 67%. When transfers are 67% of income, then optimal indexing is 50%.

In cases where transfers are a very small share of total income than they should be much better connected to local price levels. Quite possibly, they should adjust by more than 100%. This overadjustment may be a little bit puzzling, but the intuition of this effect is the same as the intuition of Bergstrom (1986). Since utilities are equalized across space, not marginal utilities, a government policy that attempts to maximize utility will scope for action. Government policy should act to equalize marginal utilities of income across space, even if they were not handing out any net transfer whatsoever.[22]

[22]However, as in Bergstrom, if private lotteries exist then individuals will be able to equalize marginal utilities of income across space. The large role for government intervention may be mitigated by the presence of private lotteries.

How Do Transfers Change with Local Price Levels?

In Figure 2, I present some preliminary evidence on how the AFDC system seems to actually deal with local price levels. There is no explicit mandate to index AFDC payments at either the state or the federal level for index. However states do decide on their local "need standard" which is defined in the Green Book (Committee on Ways and Means (1994)) as "the income the State decides in essential for basic consumption items." This definition may well incorporate local price effects and 185% of the need standard serves as an upper bound on the eligibility cutoff, but few states are even close to this limit.

Any adjustment that states are doing to local prices is done without any state level indices, which are generally unavailable. For my analysis, I was forced to use city level cost of living indices which are available in the Statistical Abstract of the U.S. and prepared by the American Chamber of Commerce Researchers Association (ACCRA). These ACCRA indices are supposed to be broad cost of living indices that include prices for housing, retail goods, fuel and so on. Unfortunately, ACCRA indices are only available for approximately 200 Metropolitan Statistical Areas (depending on which year is used) and are not available at the state level.[23] To bring this indices to the state level, I used population weighted averages of the MSA level indices.

My data on eligibility and AFDC payments comes from the Green Book (Committee on Ways and Means (1994)) and the Statistical Abstract. The data on eligibility comes from Table 10-16 in the Green Book and refers to the highest effective eligibility level for a family of three. Data on maximum benefit levels come from Table 10-11 in the Green Book. These figures include both AFDC benefits and food stamp benefits and would be available to 3 person families who have no countable income. Data on average benefit levels come from the 1995 Statistical Abstract Tables 612 and 613. Benefit levels are per family and again include food stamps.

[23]The price levels put out by the Bureau of Labor Statistics are available for a much smaller set of SMSAs.

Regression (1) shows the results for eligibility requirements. Eligibility seems to be sharply indexed at a greater than 100% level. For this to be optimal according to equation (2.10), amenities and income must be strong complements. Alternatively, this strong indexing can be justified using the extreme equity condition (2.10') if amenities are much lower in high price areas. I suspect that there are other political economy reasons for this strong degree of indexing, but the goal of this section is simply to see how indexing in practice lines up with optimal indexing, not to explain indexing behavior.[24]

Regressions (2) and (3) show the results for maximum benefits levels. Since these transfer recipients include those with no countable income, I assume W+T=T for these regressions, so the optimal coefficient on prices will be $\left(1-\Omega-\frac{1}{\sigma}\right)\Big/\left(1-\Omega+\frac{\varepsilon_I^N}{\sigma}\right)$. The regression coefficient of 1.43 in regression (2) cannot be justified with any parameter values. It suggests higher levels of local indexing than can be justified with the model. Regression (3) controls for eligibility and finds a significantly lower coefficient of 0.67. Controlling for eligibility may be appropriate if different states have welfare recipients with different human capital levels. Since the theory addresses homogeneous people, controlling for eligibility may help correct for this heterogeneity, as higher eligibility states may have higher human capital recipients.[25] This lower coefficient is well within reasonable parameter estimates and could certainly be optimal. Nevertheless, I would tend to put more stock in the coefficient in regression (2) (since eligibility takes out far more than simply local human capital differences), and take away the result that there seems to be too much indexing as it now stands.

Regressions (4) and (5) repeat regressions (2) and (3) but using average rather than maximal benefit levels. Here, as the average AFDC recipient has other income the correct coefficient is $\left(1-\Omega-\frac{1}{\sigma}\right)\Big/\left(1-\Omega+\frac{\varepsilon_I^N}{\sigma}\right)$ multiplied by

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[24]Wildasin (1991) notes that transfer levels are higher in high income states. I find that transfer levels are more sensitive to price levels than income levels.

[25]It is not obvious that higher human capital recipients should be getting higher transfers. Controlling for eligibility was strong suggested by one referee.

average total income divided by average transfer income. If we assume that the average outside income is one-half of the eligibility cutoff (i.e. incomes are uniformly distributed over this region), then this ratio will be 1.5.[26] Again with this ratio, there is no way that the degree of indexing actually found in practice can be compatible with positive degrees of relative risk aversion and positive elasticities of migration. When we control for eligibility, the coefficient falls to a level that is compatible with reasonable parameter estimates.

While it is possible that the results where eligibility is included as a control are the appropriate results, I believe that the uncontrolled results are closer to the truth. If these results are to be believed then there is far too much indexing in practice, even without an explicit indexing policy. It is easy to think of reasons why this indexing might occur, but my primary conclusion is that there is far too much connection of AFDC payments to local prices, not far too little.

IV. Conclusion

This paper has argued that it is neither equitable nor efficient to equalize the real value of transfer payments over space. Mobility of labor generally means that higher prices are compensation for something else, so that additional compensation for those prices does not increase equity. Higher prices mean that more transfers given to high cost areas will end up buying less for transfer recipients. Higher transfers in high cost areas will also distort the migration decision and lead to lower wages or higher prices in areas where transfers have been raised. Despite all of those points, as long as local amenities and income are not perfect substitutes, there may be some role for indexing transfer payments to local price levels. Since the marginal utility of income may be higher in high cost areas, transferring income to those areas may be efficient.

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[26]This was found by comparing the average food stamps plus average AFDC payments plus one half times the average eligibility cutoff divided by the average food stamps plus average AFDC payments.

However, a preliminary pass at the data suggests that as it now stands there is far too much indexing already. Currently, transfers seem to be indexed to local prices at a greater than 100% rate which is incompatible with the normative predictions of theory. While more worked is needed to understand the mechanisms that lie behind the current indexing, this paper suggests that there is ample room for changes in government incentives that would increase transfers in low cost areas and decrease transfers in high cost areas.

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Figure 1: The Optimal Connection between Transfers and Prices

Panel A $\Omega = 0$	$\sigma = 1$	$\sigma = 2$	$\sigma = 4$	$\sigma = 10$
$\varepsilon_I^N = 0$	0	.5	.75	.9
$\varepsilon_I^N = .5$	0	.4	.667	.857
$\varepsilon_I^N = 1$	0	.333	.6	.818
$\varepsilon_I^N = 2$	0	.167	.5	.75

Panel B, $\Omega = .5$	$\sigma = 1$	$\sigma = 2$	$\sigma = 4$	$\sigma = 10$
$\varepsilon_I^N = 0$	-1	0	.5	.8
$\varepsilon_I^N = .5$	-.5	0	.4	.727
$\varepsilon_I^N = 1$	-.33	0	.33	.667
$\varepsilon_I^N = 2$	-.2	0	.25	.47

Panel C, $\Omega = -.5$	$\sigma = 1$	$\sigma = 2$	$\sigma = 4$	$\sigma = 10$
$\varepsilon_I^N = 0$	.333	.667	.833	.933
$\varepsilon_I^N = .5$	.25	.57	.769	.903
$\varepsilon_I^N = 1$	.2	.5	.714	.875
$\varepsilon_I^N = 2$	.143	.4	.625	.824

Note: The table shows the optimal connection between transfers (as a share of total income) and percentage changes in the local price level. For this table, I assume that congestion effects (i.e. distortions in the labor and housing markets) are negligible and that wages are constant across space.

Figure 2: The Connection between Welfare Payments and Local Prices

	(1) Log (Eligibility)	(2) Log (Maximum Benefits)	(3) Log (Maximum Benefits)	(4) Log (Average Benefits)	(5) Log (Average Benefits)
Log(Prices)	1.78	1.43	0.67	1.97	1.08
	(.49)	(.29)	(.25)	(.35)	(.32)
Log(Eligibility)			0.43		0.50
			(.07)		(.09)
Constant	6.48	6.41	3.63	6.11	2.86
	(.04)	(.03)	(.48)	(.03)	(.60)
R-Squared	.27	.38	.67	.44	.68
Number of Observations	41	41	41	41	41

Notes: In all columns, prices were are state averages based on city-level cost of living indices gathered by American Chamber of Commerce Researchers Association (ACCRA) and given in the 1995 Statistical Abstract. Eligibility levels of for a family of three and come from the 1994 Green Book, Table 10-16. Maximum benefits are for a family of three and include food stamps and come from the 1994 Green Book, Table 10-11. The average benefits levels are per household, again include food stamps and are based on the 1995 Statistical Abstract, Table 612 and 613.