Appendix to "The Unequal Geographic Burden of Federal Taxation."
NBER Working Paper No. 13995.
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A   Additional Theoretical Details

A.1   System of Equations

The entire system consists of fourteen equations in fourteen unknowns, with four exogenous parameters: Q, A_X, A_Y, and T, where T is a city-specific head-tax (superscripts j suppressed). The first three equations (1), with an added T on the right-hand side, (2), and (3) determine the prices of land, labor, and the home good, r, w and p. With these prices given, the budget constraint and the consumption tangency condition determine the consumption quantities x and y,

$$x + py = w + R + I - T - \tau(w) \tag{A.1}$$
$$(\partial U/\partial y) / (\partial U/\partial x) = p \tag{A.2}$$

R, I, and T are given. Changes in output (X, Y), employment (N_X, N_Y, N), capital (K_X, K_Y), and land use (L_X, L_Y) are determined by nine equations in the production sector: six statements of Shepard's Lemma

$$\partial c_X/\partial w = N_X/X, \ \partial c_X/\partial r = L_X/X, \ \partial c_X/\partial i = K_X/X \tag{A.3}$$
$$\partial N_Y/\partial w = N_Y/Y, \ \partial c_Y/\partial r = L_Y/Y, \ \partial c_Y/\partial i = K_Y/Y \tag{A.4}$$

and three equations for population, the land constraint, and home-good production per capita

$$N_X + N_Y = N \tag{A.5}$$
$$L_X + L_Y = L \tag{A.6}$$
$$Y = yN \tag{A.7}$$

A.2   City-Specific Head Taxes and Quantity Changes

Determining the effects of tax deductions and deadweight loss requires calculating home-good consumption and employment changes due to differential taxation. With inelastic land and labor supply, head taxes and differential income taxes of the same magnitude have the same effects on prices and quantity differentials, and so simple head taxes are modeled for expositional brevity.

A.2.1   Prices

The system of equations given by the free-mobility and zero-profit conditions implicitly define the prices w, r, and p, as a function of the head tax T. Assume that the level of utility $\bar{u}$ is given, as in a small city, and ignore the income tax. Differentiating implicitly with respect to T creates a

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system of three equations in three unknowns: the price changes dw, dr, and dp. These equations are log-linearized with the help of Shepard's Lemma, and the notation $d\hat{z} = dz/z$:

$$s_w d\hat{w} - s_y d\hat{p} = dT/m \tag{A.8a}$$

$$\theta_L d\hat{r} + \theta_N d\hat{w} \qquad = 0 \tag{A.8b}$$

$$\phi_L d\hat{r} + \phi_N d\hat{w} - \quad d\hat{p} = 0 \tag{A.8c}$$

According to (A.8a), head taxes as a fraction of total income, dT/m, must be accompanied with wage increases or cost-of-living decreases: in equilibrium, after-tax real incomes do not change because of head taxes.[24]

The percent price changes are solved with Cramer's Rule and the accounting identities. Similar to results in the main text, we have

$$d\hat{r} = -\frac{1}{s_R} \frac{dT}{m} \tag{A.9a}$$

$$d\hat{w} = \frac{\theta_L}{\theta_N} \frac{1}{s_R} \frac{dT}{m} \tag{A.9b}$$

$$d\hat{p} = -\left(\phi_L - \phi_N \frac{\theta_L}{\theta_N} \right) \frac{1}{s_R} \frac{dT}{m} \tag{A.9c}$$

A differential head subsidy (with $dT < 0$), taking the form of a direct payment, or possibly some kind of government grant, should produce opposite and equal effects on prices.

A.2.2 Consumption

The budget constraint (A.1) and tangency condition (A.2) can be log-linearized to yield

$$s_x d\hat{x} + s_y \left(d\hat{p} + d\hat{y} \right) = s_w d\hat{w} - \frac{dT}{m} \tag{A.10}$$

$$d\hat{x} - d\hat{y} = \sigma_D d\hat{p} \tag{A.11}$$

Subtracting (A.8a) from (A.10) and substituting in (A.9c) and (A.11) yields

$$d\hat{y} = -s_x^* \sigma_D d\hat{p} = -s_x^* \sigma_D \frac{1}{s_R} \left(\phi_L - \phi_N \frac{\theta_L}{\theta_N} \right) \frac{dT}{m} \tag{A.12}$$

where $s_x^* = s_x / \left(s_x + s_y \right) = s_x/(1 - s_T)$ is the expenditure share on x out of after-tax income. By lowering home-good prices, taxes induce workers to consume more home goods.

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[24]The approach here is similar to that of Harberger (1962), Jones (1965), Mieszkowski (1972) and other incidence analyses. In particular, it resembles a model with one good and one immobile factor shown in Kotlikoff and Summers (1987), with each city operating as a different sector. A key difference is that the mobile factor, labor, responds not only to its own factor price, w, but also to the price of the locally produced good, p, so that w can vary across cities.

A.2.3 Production

In the production sector, differentiating and log-linearizing the Shepard's Lemma conditions (A.3) and (A.4) gives six equations of the following form:

$$d\hat{N}_X = d\hat{X} + \theta_L \sigma_X^{LN}(d\hat{r} - d\hat{w}) + \theta_K \sigma_X^{NK}(d\hat{i} - d\hat{w}) \tag{A.13}$$

These expressions make use of partial (Allen-Uzawa) elasticities of substitution. Each sector has three partial (Allen-Uzawa) elasticities of substitution in production for each combination of two factors, where $\sigma_X^{LN} \equiv (\partial^2 c/\partial w \partial r)/(\partial c/\partial w \cdot \partial c/\partial r)$ is the partial elasticity of substitution between labor and land in the production of X, etc. Because productivity differences are Hicks-neutral, they do not affect these elasticities of substitution. Log-linearizing the constraints (A.5), (A.6), and (A.7)

$$s_x' \theta_N d\hat{N}_X + s_y \phi_N d\hat{N}_Y = s_w d\hat{N}$$
$$s_x' \theta_L d\hat{L}_X + s_y \phi_L d\hat{L}_Y = 0$$
$$d\hat{N} + d\hat{y} = d\hat{Y}$$

where $s_x' = s_x + s_T$ is the total share of expenditures spent on traded goods, including government spending. Substituting in known values of $d\hat{r}, d\hat{w}, d\hat{i}(= 0)$, and $d\hat{y}$, from (A.9a), (A.9b), (A.12) and rearranging gives a system of nine equations in nine unknowns, written below in matrix form

$$
\begin{bmatrix}
1 & 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 0 & -1 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & -1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & -1 & 0 \\
s_x' \theta_N & 0 & 0 & 0 & s_y \phi_N & 0 & 0 & 0 & -s_w \\
0 & s_x' \theta_L & 0 & 0 & 0 & s_y \phi_L & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & -1
\end{bmatrix}
\begin{bmatrix}
d\hat{N}_X \\
d\hat{L}_X \\
d\hat{K}_X \\
d\hat{X} \\
d\hat{N}_Y \\
d\hat{L}_Y \\
d\hat{K}_Y \\
d\hat{Y} \\
d\hat{N}
\end{bmatrix}
=
\begin{bmatrix}
-\frac{\theta_L}{\theta_N}\left((\theta_L + \theta_N)\sigma_X^{NL} + \theta_K \sigma_X^{NK}\right) \\
(\theta_L + \theta_N)\sigma_X^{NL} + \theta_K \sigma_X^{LK} \\
\theta_L(\sigma_X^{NK} - \sigma_X^{LK}) \\
-\phi_L\left(\frac{\theta_L+\theta_N}{\theta_N}\right)\sigma_Y^{NL} - \phi_K \frac{\theta_L}{\theta_N}\sigma_Y^{NK} \\
\phi_N\left(\frac{\theta_L+\theta_N}{\theta_N}\right)\sigma_Y^{NL} + \phi_K \sigma_Y^{LK} \\
\phi_N \frac{\theta_L}{\theta_N}\sigma_Y^{NK} - \phi_L \sigma_Y^{LK} \\
0 \\
0 \\
s_x^* \phi_N \left(\frac{\phi_L}{\phi_N} - \frac{\theta_L}{\theta_N}\right)\sigma_D
\end{bmatrix}
\frac{1}{s_R}\frac{dT}{m}
$$

If partial elasticities within sectors are equal, $\sigma_Y^{NL} = \sigma_Y^{LK} = \sigma_Y^{NK} = \sigma_Y$, as in CES production, the solution for $d\hat{N}/dT$ gives the elasticity of employment to local taxes

$$\varepsilon = \frac{1}{(\theta_N s_R)^2}\{s_x' \theta_L \theta_N (\theta_L + \theta_N)\sigma_X + \frac{s_x s_y}{s_x + s_y}(\theta_N \phi_L - \theta_L \phi_N)^2 \sigma_D \tag{A.14}$$

$$+ s_y[\phi_L \phi_N (\theta_L + \theta_N)^2 + \phi_K(\phi_N \theta_L^2 + \theta_N^2 \phi_L)]\}\sigma_Y$$

Because of free mobility, workers require a higher wage or a lower home-good price if they are to pay higher taxes; for prices to adjust in this way, employment must fall. Overall, the higher the elasticities of substitution, the less sensitive are price changes to employment changes, and therefore the more employment must fall for the necessary price changes to occur. The higher σ_X the more slowly firms offer higher wages as employment falls; the higher σ_D the more slowly

home-good prices drop as home-good demand falls; the higher σ_Y the more slowly home-good prices drop through supply as land rents fall.

A.3 Deadweight Loss

The deadweight loss due to locational inefficiency from federal income taxation can be measured by looking at how the government's revenue changes when it replaces a small uniform lump-sum tax across all cities, T, with an income tax at rate τ, holding the utility of workers constant. The constant utility assumption is maintained if workers in the average city see no change in their income, i.e. $\tau \bar{m} = -T$. The net revenue collected from city j is then $G^j = (\tau m^j + T) N^j = \tau (w^j - \bar{w}) N^j$. Differentiating totally with respect to τ^j

$$dG^j = \left[(w^j - \bar{w}) N^j + \tau^j N^j \frac{dw^j}{d\tau} + \tau^j (w^j - \bar{w}) \frac{dN^j}{d\tau} \right] d\tau^j$$

Equations (5) and (10) give the derivatives $dw^j/d\tau = m^j (\theta_L/\theta_N)(s_w/s_R) \hat{w}^j$ and $dN^j/d\tau = \varepsilon N^j s_w \hat{w}^j$. Using these together with the first-order approximation $w^j - \bar{w} = \hat{w}^j w^j = \hat{w}^j s_w m^j$,

$$dG^j = N^j m^j \left[s_w \hat{w}^j + \tau^j \frac{\theta_L}{\theta_N} \frac{1}{s_R} \hat{w}^j + \tau^j \left(s_w \hat{w}^j \right)^2 \varepsilon \right] d\tau^j$$

Taking an approximation around the average share values, ε, and m^j, and using $E[\hat{w}^j] = 0$,

$$E[dG^j] = Nm \cdot E\left[\left(s_w \hat{w}^j \right)^2 \tau^j d\tau^j \right] \varepsilon$$

which is negative since $\varepsilon < 0$. Integrating over $d\tau^j$ and substituting in $\tau^j s_w \hat{w}^j = d\tau^j/m$ gives the triangle approximation of the deadweight loss as a percentage of national income in equation (11).

A.4 Housing Deduction

Incorporating the home-good deduction into the income tax, $\tau (m - \delta py)$, changes the mobility condition (4a) and the log-linearized budget constraint (A.10) to

$$\hat{Q} = (1 - \delta \tau') s_y \hat{p} - \delta \tau' s_y \hat{y} - (1 - \tau') s_w \hat{w} \tag{A.15}$$
$$s_x \hat{x} = - (1 - \delta \tau') s_y \hat{p} - (1 - \delta \tau') s_y \hat{y} + (1 - \tau') s_w \hat{w}$$

Adding these expressions gives

$$\hat{Q} + s_x \hat{x} = -s_y \hat{y}$$

Substituting in $\hat{x} = \hat{y} + \sigma_D \hat{p}$, and using $\eta^c = -s_x^* \sigma_D < 0$, we have

$$\hat{y} = -(\hat{Q} + s_x \sigma_D \hat{p})/(s_x + s_y) = \eta^c \hat{p} - \hat{Q}/(s_x + s_y)$$

This expression is used in (15), although s_T is set to zero there for expositional ease. Substituting back into (A.15) and using $s_y^* \equiv s_y/(s_x + s_y)$

$$\hat{Q} = \{[1 - \delta\tau'(1 - |\eta^c|)]s_y\hat{p} - (1 - \tau')s_w\hat{w}\}/(1 - \delta\tau's_y^*) \tag{A.16}$$

Solving completely with (4b) and (4c)

$$\frac{d\tau}{m} = \tau'\frac{[1-\delta(1-|\eta^c|)]\frac{s_y}{s_R}\left(\frac{s_w\phi_L}{\theta_N}\hat{A}^X - \frac{s_w\theta_L}{\theta_N}\hat{A}^Y\right) + \left\{s_y\delta\left[1-(1-|\eta^c|)\frac{1}{s_R}\left(\phi_L - \phi_N\frac{\theta_L}{\theta_N}\right)\right] - \frac{\theta_L}{\theta_N}\frac{s_w}{s_R}\right\}\hat{Q}}{1 - \tau'\frac{\theta_L}{\theta_N}\frac{s_w}{s_R} - \delta\tau'(1-|\eta^c|)\frac{s_y}{s_R}\left(\phi_L - \phi_N\frac{\theta_L}{\theta_N}\right)} \tag{A.17}$$

which can also be re-expressed in terms of the the pre-tax differentials, $\hat{w}_0$, and $\hat{p}_0$, seen in (6) and (9b)

$$\frac{d\tau}{m} = \frac{\tau's_w\hat{w}_0 - \delta\tau'(1 - |\eta^c|)s_y\hat{p}_0 + \delta\tau's_y\hat{Q}}{1 - \tau'\frac{\theta_L}{\theta_N}\frac{s_w}{s_R} - \delta\tau'(1 - |\eta^c|)\frac{s_y}{s_R}\left(\phi_L - \phi_N\frac{\theta_L}{\theta_N}\right)} \tag{A.18}$$

The term in the denominator of (A.18) now reflects two multiplier effects: cities taxed more heavily see wages rise, raising taxes through the wage-tax effect. They also see home-good prices fall, raising taxes through the partial-indexation effect.

A.5 Federal and State Taxes Combined

Tax differentials at the federal (F) and state (S) level for city j are

$$d\tau_F^j/m = \tau_F'[s_w\hat{w}^j - \delta_F s_y(1 - |\eta^c|)\hat{p}^j + \delta_F s_y^*\hat{Q}^j]$$
$$d\tau_S^j/m = \tau_S'[s_w(\hat{w}^j - \hat{w}^S) - \delta_S s_y(1 - |\eta^c|)(\hat{p}^j - \hat{p}^S) + \delta_S s_y^*(\hat{Q}^j - \hat{Q}^S)]$$

τ_F' and τ_S' are the marginal tax rates at the federal and state level, δ_F and δ_S are associated deduction levels, and $\hat{w}^S, \hat{p}^S$, and $\hat{Q}^S$ are the differentials for state S as a whole relative to the entire country. The full tax differential is the sum $d\tau^j/m = d\tau_F^j/m + d\tau_S^j/m$. These formulas require the quality-of-life estimates

$$\hat{Q}^S = \{[1 - \delta_F\tau_F'(1 - |\eta^c|)]s_y\hat{p}^S - (1 - \tau_F')s_w\hat{w}^S\}/(1 - \delta_F\tau_F's_y^*)$$
$$\hat{Q}^j = \{[1 - \delta_F\tau_F'(1 - |\eta^c|)]s_y\hat{p}^j - \delta_S\tau_S'(1 - |\eta^c|)s_y(\hat{p}^j - \hat{p}^S) - (1 - \tau_F')s_w\hat{w}^j$$
$$+ \tau_S's_w\left(\hat{w}^j - \hat{w}^S\right) - \tau_S'\delta_S\hat{Q}^S s_y^*\}/[1 - s_y(\tau_F'\delta_F + \tau_S'\delta_S)]$$

B Parameter Calibration

The calibration below draws from similar calibrations in Rappaport (2008) and Shapiro (2006), although the models, as well as the choices made here, are different.

B.1 Cost, Income, and Consumption Shares

There are twelve cost, income, and consumption share parameters, but because of income identities, only six are independent. For example, choosing $s_w, s_I, \theta_L, \phi_L, s_y$, and s_T gives values of

$\theta_N, \theta_K, \phi_L, \phi_K, s_x$, and s_R. Therefore, only estimates of any six shares are necessary, although information on other shares can help cross-validate these estimates. Unfortunately, information collected from different sources is not entirely consistent: some judgment is needed to find the most plausible calibration.

Looking first at income shares, Krueger (1999) makes a strong case that the share of income to labor, s_w, is close to 0.75. Estimates from Poterba (1998) imply that the income share to capital, s_I, is higher than 0.12, probably in the neighborhood of 0.15. This leaves approximately 10 percent for the income derived from land. This is consistent with Keiper et al., (1961) who find that the share of income from land in 1956 was between 0.04 and 0.12, depending on the rate of return used.[25]

Turning next to expenditure shares, Albouy (2008), Moretti (2008), and Shapiro (2006) find that housing costs can be used to approximate non-housing as well as housing cost differences across cities. The total cost-of-living differential is equal to $s_y \hat{p}^j$, where $\hat{p}^j$ is equal to the housing-cost differential and s_y is equal to the expenditure share on housing plus an additional term to capture how a one percent increase in housing costs predicts a $b = 0.26$ percent increase in non housing costs. In the Consumer Expenditure Survey (CEX), the share of income spent on shelter and utilities, s_{hous}, is 0.22, although, the share of income spent on other goods, s_{oth}, is 0.56, with the remaining 0.22 spent on taxes or saved (Bureau of Labor Statistics 2002). Thus, the coefficient on on housing costs is equal $s_y = s_{hous} + s_{oth}b = 0.22 + 0.56 \times 0.26 = 0.36$.

According to the Bureau of Economic Analysis, total government expenditures at all levels is equal to 15 percent of GDP, although this includes many locally-provided goods which are tied to local taxes, so this is likely an upper bound for the model. Unfortunately, the BEA numbers make it difficult to determine which government expenditures are tied directly to local taxes, which should be excluded from the model. It is also unclear how to treat federal interest payments, which were then 2.8 percent of GDP. A value of $s_T = 0.15$ is used, although lowering this number has almost no effect on the predictions in the model since it only changes the already minor QOL income effect: lowering s_T to 0.1, a reasonable lower bound, would increase the QOL income effect by only 6 percent.

The cost-share of land in traded goods, θ_L, appears to be small: Beeson and Eberts (1986) use a value of 0.027, while Rappaport (2008) uses a smaller value of 0.016. Valentinyi and Herrendorff (2008) estimate the land share of tradeables at 4 percent, although their definition of tradeables differs from the definition here. A value of $\theta_L = 0.025$ is used here. The cost-share of land in home-goods, taken as housing costs, ϕ_L, is taken at 23 percent: this is slightly above values reported in McDonald (1981), Roback (1982), and Thorsnes (1997) to take into account an increase in land-cost shares over time seen in Davis and Heathcoate (2007). Together with the expenditure shares, these cost shares imply that income-share of land, s_R, is 10 percent, with 83 percent of land in cities going to the production of home goods. This is roughly consistent with patterns in Keiper et al. (1961).[26]

Because there is only one remaining free parameter, the next choice simultaneously determines the cost shares of labor and capital in the two production sectors. As information on the cost-share

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[25]The values Keiper reports were at a historical low. The total land value was found to be about 1.1 times GDP. A rate of return of 9 percent would justify using $s_R = 0.10$.

[26]Keiper et al. (1961) find that about 52.5 of land value is in residential uses, a 22.9 percent in industry, 20.9 percent in agriculture. In the base calibration of the model, 51 percent of land is devoted to actual housing, 32 percent is for non-housing home goods, and 17 percent is for traded goods, including those purchased by the federal government.

of capital in the housing sector, ϕ_K, or the traded sector, θ_N, is unavailable, the capital shares in both sectors are set equal to 15 percent. The remaining cost shares for labor are then determined by the identities, with the share in traded goods, θ_N, equal to 82.5 percent and the share in home goods, ϕ_N, equal to 62 percent.[27]

B.2 Elasticities

Finding elasticities is more challenging than finding shares and is complicated by the fact that differences in tastes or in production technology can lead to sorting behavior across cities, which make elasticities of substitution measured at the national scale larger than elasticities measured at the city or individual level. Fortunately, the two reduced-form elasticities needed for the simulation here have been estimated independently and at the city level.

The compensated price elasticity of home goods, η^c, is approximated with the compensated price elasticity for housing services, η^c_{hous}. The Slutsky equation for the compensated price elasticity is $\eta^c_{hous} = \eta_{hous} + s_{hous}\eta_{hous,m}$, where η_{hous} is the uncompensated price elasticity and $\eta_{hous,m}$ is the income elasticity. There is a large literature devoted to trying to estimate these parameters, including Rosen (1985), Goodman and Kawai (1986), Goodman (1988) Ermisch et al. (1996), Goodman (2002), and Ionnides and Zabel (2003). The range of plausible estimates in this literature is large, with uncompensated price elasticities ranging from -1 to -0.3, and income elasticities from 1 to 0.4. This implies that the homothetic assumption is a sensible approximation, and that the compensated elasticities lie in the range of -0.08 to -0.91. A midrange value of $\eta^c = -0.5$ is used for the base calibration. η^c provides the elasticity of substitution value of $\sigma_D = -\eta^c/s_x^*$, which under the current calibration is $\sigma_D = 0.67$.

The elasticity of employment with respect to taxes as a percentage of income, ε, is essential in determining the employment effects and deadweight loss from uneven federal taxation. There are two ways to determine ε: first, through direct estimates; second, to infer $\varepsilon_{NT/m}$ theoretically through equation (A.14), although this requires all share and substitution parameters, and the assumption that the model is exactly true. For example, allowing for elastic labor and land supply does not change the predicted price effects, but it does increase elasticity for ε; ignoring these effects will produce a conservative estimate (see Appendix D). Substituting in the share parameters already calibrated into this equation yields

$$\varepsilon = -1,65\sigma_X - 6.76\sigma_Y - 0.96\sigma_D \tag{A.19}$$

revealing that ε is particularly sensitive to the choice of σ_Y. If preferences and production are assumed to be Cobb-Douglas, so that $\sigma_X = \sigma_Y = \sigma_D = 1$, then ε is -9.37. This case seems unlikely, as the value of σ_D appears to be less than one, as do the elasticities of substitution in production σ_X and σ_Y..

Conventional measures of the elasticity of substitution between labor and capital in the national

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[27]Studies of housing rarely distinguish labor and capital costs, however, studies of the construction industry (Cassimatis, 1969) find the costs share of labor, materials, capital depreciation, and overhead, to be approximately 30, 45, 2, and 23 percent. These figures ignore a number of other labor-intensive inputs to housing, including sales and maintenance. The amount of capital embodied in a house is tricky to define in this static model. Materials and traded goods appear to be largely indistinguishable as both have prices set by trade. In practice this difference proves to be largely semantic rather than substantial.

economy, which might correspond most closely to σ_X, tend not to reject a value of one (e.g. Berndt, 1976). However, Antras (2004) as well as other studies, going as far back as Lucas (1969), have found that these estimates may be biased upwards, and that the elasticity is closer to 0.7. One result from trade theory is that because of specialization in production, a city-level elasticity is likely to be lower than the macro elasticity, making a lower estimate seem more reasonable. Given this consideration, $\sigma_X = 0.67$ seems reasonable.

Estimates of the elasticity of substitution between land and non-land factors in the housing production, which may correspond most closely to σ_Y, range from one to as low as 0.3. (McDonald 1981, Epple et al. forthcoming), with a midrange value of $\sigma_Y = 0.67$ appearing plausible. However, as there is considerable uncertainty over this parameter, additional information is of value. Thus using the plausible elasticities $\sigma_X = \sigma_Y = \sigma_D = 0.67$ produces $\varepsilon = 6.25$.

Because the model is not exactly true, and because it is sensitive to σ_Y, looking for direct estimates of ε seems preferable to inferring through equation (A.14). In a meta-analysis, Bartik (1991) looks at 48 inter-area studies and finds that the average elasticity of output to local taxes as a percent of taxes (not total income) is -0.25. Studies more fitting to the model exhibit somewhat larger elasticities: 30 studies with public service controls have an average elasticity of -0.33; the 12 studies with fixed-effect controls have an average elasticity of -0.44. Taking the -0.33 elasticity and multiplying it by 20, the ratio of total costs to local taxes' cost share (5 percent), gives an elasticity of output to local taxes as a percent of total costs (or income) of $\varepsilon_{Out} = -6.67$. Assuming that output is taken as a mix of traded-good and home-good production, weighted by their expenditure shares, it is possible to solve for the elasticity of total output with respect to taxes. Using the share parameters already calibrated, this is given by

$$\varepsilon_{Out} = \left[(s_x + s_T) \hat{X} + s_y \hat{Y} \right] / (dT/m) = -2.58\sigma_X - 7.47\sigma_Y - 1.08\sigma_D \tag{A.20}$$

Combining (A.20) with (A.19) it is possible to eliminate σ_Y

$$\varepsilon = 0.91\varepsilon_{Out} - 0.69\sigma_X - 0.03\sigma_D$$

Note that this formula is not especially sensitive to the values of σ_X and σ_D: it depends primarily on the value of $\varepsilon_{Out,T/m}$. Substituting in $\varepsilon_{Out,T/m} = -6.67$, $\sigma_X = 0.67$, and $\sigma_D = 0.67$, yields a value of $\varepsilon = -5.56$. This is consistent with a value of $\sigma_Y = -0.57$. The panel estimates would produce an even larger elasticity. A value of $\varepsilon = -6.0$ is taken in the main calibration.[28]

B.3 Tax Structure

The federal marginal tax rate on wage income is determined by adding together federal marginal income tax rate and the effective marginal payroll tax rate. TAXSIM gives an average marginal federal income tax rate of 25.1 percent in 2000. In 2000, Social Security (OASDI) and Medicare

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[28]The elasticity would also be slightly larger (-6.92) if the conversion were based on partial equilibrium formulas, as in Bartik (1991). Note that Bartik's meta-analysis has undergone significant scrutiny, although it has been largely upheld for tax-effects when public services are held constant (Phillips and Goss 1995).

A well cited figure by Blanchard and Katz (1992) is that the elasticity of employment with respect to wages is -2.5. Dividing this by $s_w = 0.75$, gives a smaller number of $\varepsilon = -3.25$. However, their estimate allows for all kinds of employment shocks, not just those with taxes, making the relevance of their estimate to this application questionable.

(HI) tax rates were 12.4 and 2.9 percent on employer and employee combined. Estimates from Boskin et al. (1987, Table 4) show that the marginal benefit from future returns from OASDI taxes is fairly low, generally no more than 50 percent, although only 85 percent of wage earnings are subject to the OASDI cap. HI taxes emulate a pure tax (Congressional Budget Office 2005). These facts suggest adding 37.5 percent of the Social Security tax and all of the Medicare tax to the federal income tax rate, adding 8.2 percent. The employer half of the payroll tax (4.1 percent) has to be added to observed wage levels to produce gross wage levels. Overall, this puts an overall federal tax rate of 33.3 percent tax rate on gross wages, although only a 29.2 percent rate on observed wages.

Determining the federal deduction level requires taking into account the fact that many households do not itemize deductions. According to the Statistics on Income, although only 33 percent of tax returns itemize, they account for 67 percent of reported Adjusted Gross Income (AGI). Since the income-weighted share is what matters, 67 percent is multiplied by the effective tax reduction given in TAXSIM, in 2000 of 21.6 percent. Thus, on average these deductions reduce the effective price of eligible goods by 14.5 percent. Since eligible goods only include housing, this deduction applies to only 59 percent of home goods. Multiplying 14.5 percent times 59 percent gives an effective price reduction of 8.6 percent for home goods. Divided by a federal tax rate of 33.3 percent, this produces a federal deduction level of 25.7 percent.

State income tax rates from 2000 are taken from TAXSIM, which, per dollar, fall at an average marginal rate of 4.5 percent. State sales tax data in 2000 are taken from the Tax Policy Center, originally supplied by the Federation of Tax Administrators. The average state sales tax rate is 5.2 percent. Sales tax rates are reduced by 10 percent to accommodate untaxed goods and services other than food or housing (Feenberg et al. 1997), and by another 8 percent in states that exempt food. Overall state taxes raise the marginal tax rate on wage differences within state by an average of 5.9 percentage points, from zero points in Alaska to 8.8 points in Minnesota.

State-level deductions for housing expenditures, explicit in income taxes, and implicit in sales taxes, should also be included. At the state level, deductions for income taxes are calculated in an equivalent way using TAXSIM data. Furthermore, all housing expenditures are deducted from the sales tax. Overall this produces an effective deduction level of $\delta = 0.292$.

In summary, the following values are taken for the calibration

$$
\begin{array}{llllll}
s_x = 0.49 & \theta_L = 0.025 & \phi_L = 0.233 & s_R = 0.10 & \eta^c = -0.50 & \tau' = 0.36 \\
s_y = 0.36 & \theta_N = 0.825 & \phi_N = 0.617 & s_w = 0.75 & \varepsilon = -6.0 & \delta = 0.292 \\
s_T = 0.15 & \theta_K = 0.15 & \phi_K = 0.15 & s_I = 0.15 & &
\end{array}
$$

where τ' and δ refer to average rates on gross wage and price differences.

C Data and Estimation

I use United States Census data from the 2000 Integrated Public-Use Microdata Series (IPUMS), from Ruggles et al. (2004), to calculate wage and housing price differentials. The wage differentials are calculated for workers ages 25 to 55, who report working at least 30 hours a week, 26 weeks a year. The MSA/CMSA assigned to a worker is determined by their place of residence, rather than their place of work. The wage differential of an MSA is found by regressing log hourly

wages on individual covariates and indicators for a worker's MSA of residence, using the coefficients on these MSA indicators. The covariates consist of

- 12 indicators of educational attainment;

- a quartic in potential experience, and potential experience interacted with years of education;

- 9 indicators of industry at the one-digit level (1950 classification);

- 9 indicators of employment at the one-digit level (1950 classification);

- 4 indicators of marital status (married, divorced, widowed, separated);

- an indicator for veteran status, and veteran status interacted with age;

- 5 indicators of minority status (Black, Hispanic, Asian, Native American, and other);

- an indicator of immigrant status, years since immigration, and immigrant status interacted with black, Hispanic, Asian, and other;

- 2 indicators for English proficiency (none or poor).

All covariates are interacted with gender.

I first run the regression using census-person weights. From the regressions a predicted wage is calculated using individual characteristics alone, controlling for MSA, to form a new weight equal to the predicted wage times the census-person weight. These new income-adjusted weights are needed since workers need to be weighted by their income share. The new weights are then used in a second regression, which is used to calculate the city-wage differentials from the MSA indicator variables. In practice, this weighting procedure has only a small effect on the estimated wage differentials.

Housing-cost differentials are calculated using the logarithm of rents, whether they are reported gross rents or imputed rents derived from housing values. The differential housing cost of an MSA is calculated in a manner similar to wages, except using a regression of the actual or imputed rent on a set of covariates at the unit level. The covariates for the adjusted differential are

- 9 indicators of building size;

- 9 indicators for the number of rooms, 5 indicators for the number of bedrooms, number of rooms interacted with number of bedrooms, and the number of household members per room;

- 2 indicators for lot size;

- 7 indicators for when the building was built;

- 2 indicators for complete plumbing and kitchen facilities;

- an indicator for commercial use;

- an indicator for condominium status (owned units only).

I first run a regression of housing values on housing characteristics and MSA indicator variables using only owner-occupied units, weighting by census-housing weights. A new value-adjusted weight is calculated by multiplying the census-housing weights by the predicted value from this first regression using housing characteristics alone, controlling for MSA. A second regression is run using these new weights for all units, rented and owner-occupied, on the housing characteristics fully interacted with tenure, along with the MSA indicators, which are not interacted. The house-price differentials are taken from the MSA indicator variables in this second regression. As with the wage differentials, this adjusted weighting method has only a small impact on the measured price differentials.

Federal spending differentials are calculated using the Consolidated Federal Funds Report (CFFR) which reports spending for different programs by county. Counties can be matched to MSAs without difficulty, except for New England, where New England County Metropolitan Areas (NECMAs) are used in place of MSAs to calculate the spending differential. Spending in MSAs including capitals may be biased upwards as spending targeted to a state may be labeled as applying to the capital.

Total federal spending in 2000 is worth $5,740 per capita or 19.2 percent of personal income. Federal spending is divided into three categories: (i) wages and contracts, (ii) transfers to non-workers, and (iii) other spending. Wages and contracts are worth about $1,450 per capita, or 4.8 percent of GDP, and include

- federal wages and salaries, both military and civilian;

- procurement contracts, defense and non-defense.

Transfers to non-workers are worth about $2,850 per capita, or 9.5 percent of income, and includes

- Social Security payments;

- Medicare payments;

- 25 percent of Medicaid and CHIP;

- government pensions;

- veterans' benefits;

- benefits to college students, mainly loans.

Other spending is worth about $1,500 per capita, or 5.0 percent of income, and includes

- 75 percent of Medicaid and CHIP;

- housing programs, including Section 8;

- most welfare programs, including TANF and Food Stamps;

- most other government grants, such as for transportation.

The raw spending differentials are calculated by taking the residual of the logarithm of per capita federal spending from a regression on a constant, weighted by population per city. The adjusted spending differentials are calculated in the same way, except that the regression includes the following variables

- average years of schooling and the proportion in four educational attainment categories (dropout, high school degree, associates degree, bachelors degree or more);

- average age, average potential experience, percent under 18, and percent 65 or older;

- percent married;

- percent veteran;

- percent in each of the 5 minority groups;

- the proportion in each of the immigrant variables described above.

Since data are not available at the available at the individual level, these covariates are more parsimonious than those used at the individual or housing-unit level to avoid "over-fitting" the data. Regressions are weighted by population per city. Spending differentials are multiplied by their share of personal income so that, like tax differentials, they are measured as a fraction of total income.

D Theoretical Extensions

D.1 Elastic Factor Supplies

Property owners are assumed to supply a fixed amount of land; workers, a fixed amount of labor. Relaxing these assumptions has no effect on equations (4a), (4b), and (4c), determining price differentials across cities – a result of duality theory. These assumptions do affect quantities in the model: variable supply of either land or labor increases the responsiveness of employment to taxes given in ε. Denoting the elasticity of land supply to an increase in rents as $\varepsilon_{L,r}$ and the elasticity of labor supply to an increase in real wages as $\varepsilon_{h,w}$ then the elasticity of local employment to taxes is given by

$$\varepsilon^{variable} = \varepsilon - \frac{1}{s_R}\varepsilon_{L,r} - s_w \frac{(s_x + s_T)\theta_L + s_y(\theta_N\phi_L - \theta_L\phi_N)}{(s_R)^2(s_x + s_T)\theta_N}\left[\frac{\theta_L}{\theta_N} + s_y\left(\phi_L - \phi_N\frac{\theta_L}{\theta_N}\right)\right]\varepsilon_{h,w}$$

where ε is the elasticity from the previous formula (A.14). Higher taxes lower land supplies, decreasing the available supply of land to produce with and live on, lowering the number of workers. Higher taxes also increase pre-tax real wages by increasing the nominal wage and lowering the price of home-goods. Workers respond by increasing their labor supply, so that firms have to hire a smaller number of workers to achieve the same labor input, lowering the amount of needed workers. Workers consume more in home-goods per capita, so that with a fixed or diminishing supply of land, worker density must decrease. Since the calibration already relies on a direct estimate of ε, these types of deviations are accounted for in the simulation.

D.2 Imperfect Mobility

Imperfect mobility can be modeled by assuming that individuals have different tastes for living in different cities. For a given city, say Chicago, let the taste for living in Chicago be given by ξ_i, so that the expenditure function for a potential resident i is given by

$$e(p, u, Q, \xi_i) = e(p, u)/(Q\xi_i)$$

where ξ_i represents a taste parameter for living in Chicago. For the marginal entrant

$$e(p, \bar{u})/(Q\xi_k) = m - T \tag{A.21}$$

where k indexes the marginal individual, and $\bar{u}$ is the reservation utility, which is equal across workers. Fully differentiating (A.21),

$$s_w \hat{w} - s_y \hat{p} = \frac{dT}{m} - \hat{\xi}_k$$

Assume that ξ_i follows a Pareto distribution with parameter $1/\psi$

$$F\left(\xi_{i'}\right) = 1 - \left(\frac{\underline{\xi}}{\xi_i}\right)^{1/\psi}, \ \xi_i \geq \underline{\xi}$$

A larger value of ψ implies a thicker tail to the distribution; the larger ψ, the more tastes for living in Chicago vary across the population. Each city could in principle have a different ψ value. For some given constant, μ, the population in Chicago is $N = \mu \Pr(\xi_i \geq \xi_k) = \mu[1 - F\left(\xi_k\right)] = \mu \left(\underline{\xi}/\xi_k\right)^{1/\psi}$, thus

$$\log N = \log \mu + \frac{1}{\psi}[\log \underline{\xi} - \log \xi_k]$$

Totally differentiating, $\hat{N} = -\hat{\xi}_k/\psi$, so that the worker-mobility condition in (A.21) can be rewritten as

$$s_w \hat{w} - s_y \hat{p} = \frac{dT}{m} + \psi \hat{N} \tag{A.22}$$

ψ represents the elasticity of a workers' marginal willingness to pay to live in the given city, as a fraction of total income. In other words, if the population of the city is artificially lowered by one percent, the marginal willingness to pay rises by ψ percent. This is indicative of a downward sloping demand curve to live in Chicago. Equation (A.22) also produces an upward sloping supply curve of workers to Chicago.

Using this condition to replace (A.8a) and solving as before, the elasticity of workers with respect to taxes is now a function of ψ, with

$$\varepsilon(\psi) = \frac{\varepsilon(0)}{1 + \psi \left[\frac{s_y}{s_R}\left(\phi_L - \frac{\theta_L}{\theta_N}\phi_N\right) - \varepsilon(0)\right]} \tag{A.23}$$

where $\varepsilon(0)$ is the elasticity given in (A.14), which assumed homogenous tastes, i.e. $\psi = 0$. Thus, $1/\psi$ may be interpreted as a mobility parameter, as a higher ψ represents lower mobility, from

$\psi = 0$ for perfect mobility, to $\psi = \infty$ for perfect immobility, as $\varepsilon(\infty) = 0$.

The effects of taxes on prices depends on the product of ψ and the elasticity $\varepsilon(\psi)$

$$d\hat{r} = -\frac{1 + \psi\varepsilon(\psi)}{s_R}\frac{dT}{m}$$

$$d\hat{w} = \frac{1 + \psi\varepsilon(\psi)}{s_R}\frac{\theta_L}{\theta_N}\frac{dT}{m}$$

$$d\hat{p} = -\frac{1 + \psi\varepsilon(\psi)}{s_R}\left(\phi_L - \frac{\theta_L}{\theta_N}\phi_N\right)\frac{dT}{m}$$

It is straightforward to show that the product $\psi\varepsilon(\psi)$ must fall between -1 and 0, and is decreasing in ψ, so that the impact of taxes on local prices is reduced by greater immobility. However, even with complete immobility the price effects are non-zero and have the same sign as the case with perfect mobility as

$$\lim_{\psi \to \infty} \psi\varepsilon(\psi) = \frac{\varepsilon(0)}{\frac{s_y}{s_R}\left(\phi_L - \frac{\theta_L}{\theta_N}\phi_N\right) - \varepsilon(0)}$$

is strictly greater than -1. Because $\varepsilon(0) < \varepsilon(\psi)$, equation (A.23) implies an upper bound for ψ of $\left[\frac{s_y}{s_R}\left(\phi_L - \frac{\theta_L}{\theta_N}\phi_N\right) - \varepsilon(\psi)\right]^{-1}$, which according to the main calibration is $[17/32 + 6]^{-1} = 32/209 \cong 0.15$. The product $\psi\varepsilon(\psi)$ is then bounded above by $(32/209) \times 6 = 192/209 \cong 0.92$, so that price effects are bounded below by 8 percent of the values posited in equations (A.9a) to (A.9c). Unfortunately, without a concrete value of ψ it is hard to say whether the true effects on prices lie closer to 8 percent or 100 percent of these values. Given the persistence of federal tax differentials, it may be reasonable to assume that mobility is fairly perfect in the long run, so that the effects are closer to 100 percent.

With less than full capitalization into prices, a local tax on workers falls not just on land, but on workers who do not move. The welfare change of these non-moving inframarginal workers, expressed as a compensating variation divided by total income, is given by their change in real income

$$\frac{1}{m}d[w - e(p, u)] = s_w d\hat{w} - s_y d\hat{p} - \frac{dT}{m}$$

$$= \psi\varepsilon(\psi)\frac{dT}{m}$$

The effect on local land prices and welfare together add up to the local burden of the tax, i.e. $\frac{1}{m}d[w - e(p, u)] + s_R d\hat{r} = dT/m$. Thus, if local prices do not fully capitalize federal tax differences, the remainder is borne by local "infra-marginal" workers, who are more attached to their city. Thus the differential tax burden is split between local labor and land, with the ratio given by

$$\frac{\frac{1}{m}d[w - e(p, u)]}{s_R d\hat{r}} = \frac{\psi\varepsilon(0)}{1 + \psi\frac{s_y}{s_R}\left(\phi_L - \frac{\theta_L}{\theta_N}\phi_N\right)}$$

which increases with ψ and lies between 0 and $\varepsilon(0)/\frac{s_y}{s_R}\left(\phi_L - \frac{\theta_L}{\theta_N}\phi_N\right)$.

D.3 Multiple Worker Types

Assume there are two types of fully mobile workers, referred to using "a" and "b" as superscripts, and that each type is employed in every city. For simplicity and brevity assume that $\phi_L = 1$ so that $p = r/A_Y$. The three equations defining the system are

$$e^a(r/A_Y, \bar{u}^a)/Q^a = w^a + R^a - \tau^a \tag{A.24a}$$

$$e^b(r/A_Y, \bar{u}^b)/Q^b = w^b + R^b - \tau^b \tag{A.24b}$$

$$c_X(w^a, w^b, r) = A_X \tag{A.24c}$$

This is very similar to the model in Roback (1988), although she assumes that $s_w^a = s_w^b = 1$, that $A^Y = 1$ everywhere, and does not include taxes. Let the share of total income accruing to a-worker be $\mu^a = N^a m^a / \left(N^a m^a + N^b m^b\right)$, with $\mu^b = 1 - \mu^a$. Log-linearizing and solving the system reveals the wage differential for a type a worker

$$\hat{w}^a = \frac{1}{s_R s_w^a}\left\{s_y^a s_x \hat{A}_X + s_x \theta_L\left(\frac{d\tau^a}{m^a} - \hat{Q}^a - s_y^a \hat{A}_Y\right)\right\} + \tag{A.25}$$

$$\frac{\mu^b}{s_R s_w^a}\left\{\left[s_y^b\left(\frac{d\tau^a}{m^a} - \hat{Q}^a\right) - s_y^a\left(\frac{d\tau^b}{m^b} - \hat{Q}^b\right)\right]\right\}$$

where an analogous expression holds for $\hat{w}^b$. Comparing this equation with (6), a new effect is given by the term beginning with μ^b: a-type wages are higher in cities where a-types pay higher taxes or receive fewer quality-of-life benefits relative to b-types.

Define the following income-weighted averages

$$s_x = \mu^a s_x^a + \mu^b s_x^b, \ s_y = \mu^a s_y^a + \mu^b s_y^b$$

$$\hat{Q} = \mu^a \hat{Q}^a + \mu^b \hat{Q}^b, \ \frac{d\tau}{m} = \mu^a \tau'^a s_w^a \hat{w}^a + \mu^b \tau'^b s_w^b \hat{w}^b$$

The rent differential and the average wage differential, weighted by wage-income shares, are

$$\hat{r} = \frac{1}{s_R}\left(\hat{Q} + s_x \hat{A}_X + s_y \hat{A}_Y - \frac{d\tau}{m}\right) \tag{A.26}$$

$$\hat{w} \equiv \frac{1}{s_w}\left(s_w^a \mu^a \hat{w}^a + s_w^b \mu^b \hat{w}^b\right) = \frac{1}{\theta_N s_R}\left[s_y \hat{A}_X - s_y \theta_L \hat{A}_Y + \theta_L\left(\frac{d\tau}{m} - \hat{Q}\right)\right] \tag{A.27}$$

which are analogous to the previous expressions given in (9a) and (6) with homogenous types, except that now the quantities in the model refer to income-weighted averages. Thus, aggregating multiple worker types does not substantially alter overall price effects, however differential taxation does have some interesting quantity effects.

The relative wage difference

$$\hat{w}^a - \hat{w}^b = \frac{1}{s_R}\left\{\left(\frac{s_y^a}{s_w^a} - \frac{s_y^b}{s_w^b}\right) s_x \hat{A}_X\right\} +$$

$$\frac{1}{s_R}\left\{\left(s_x\theta_L + s_w\frac{s_y^b}{s_w^b}\right)\frac{1}{s_w^a}\left(\frac{d\tau^a}{m^a} - \hat{Q}^a\right) - \left(s_x\theta_L + s_w\frac{s_y^a}{s_w^a}\right)\frac{1}{s_w^b}\left(\frac{d\tau^b}{m^b} - \hat{Q}^b\right)\right\}$$

determines the relative levels of employment. In the CES case, workers paid higher wages are employed in fewer numbers, with the amount determined by the elasticity of substitution.

$$\hat{N}^a - \hat{N}^b = -\sigma_X\left(\hat{w}^a - \hat{w}^a\right) \tag{A.28}$$

If workers have similar tastes, receive equal shares of income from labor, and pay the same marginal income tax rates, so that $s_y^a = s_y^b$, $s_w^a = s_w^b$, $\hat{Q}^a = \hat{Q}^b$, and $\tau'^a = \tau'^b$, then $\hat{w}^a = \hat{w}^b$ and $\hat{N}^a = \hat{N}^b$: workers simply supply different "efficiency units" of labor to each city.

Relative tax differentials paid depend on both the relative wage and on relative employment.

$$\left(\frac{\widehat{N^a d\tau^a/m^a}}{N^b d\tau^b/m^b}\right) = \hat{N}^a + s_w^a \hat{w}^a - \hat{N}^b - s_w^b \hat{w}^b = (s_w^a - \sigma_X)\hat{w}^a - (s_w^b - \sigma_X)\hat{w}^b$$

It is unclear whether workers receiving a higher relative wage in a city pay a higher relative tax burden, as fewer of those workers will live in the city. If $\sigma_X \geq \min\left\{s_w^a, s_w^b\right\}$ then sorting effects dominate wage effects, so that workers receiving a lower wage in a city pay a larger relative share of its income tax burden because they are more numerous.

A number of conclusions can be drawn by assuming workers are equal in all but one dimension. First, workers who put greater value on quality-of-life ($\hat{Q}^a > \hat{Q}^b$, $s_y^a = s_y^b$, and $s_w^a = s_w^b$) will take relatively lower wages and be more populous in nice cities; because they are paid less and sort disproportionately into low-wage cities, these workers pay lower taxes, and are relatively better off. Workers who receive more of their income in non-wage form ($s_w^a < s_w^b$, $s_y^a = s_y^b$, and $\hat{Q}^a = \hat{Q}^b$) find it advantageous to live in nice cities and to avoid productive cities. Although within a given city, these workers pay the same tax differentials as other types ($s_w^a\hat{w}^a = s_w^b\hat{w}^b$), as they sort disproportionately into low-tax cities they pay less total taxes. Workers with a strong taste for the home good ($s_y^a > s_y^b$, $s_w^a = s_w^b$, $\hat{Q}^a = \hat{Q}^b$) are paid higher wages and are less populous in nice or productive cities: the overall effect on their tax burdens is indeterminate.

Finally, workers facing higher marginal tax rates ($\tau'^a > \tau'^b$) respond more strongly to the incentive to avoid productive cities and seek nicer cities. Workers with different skills and incomes often face different marginal tax rates. Although income tax rates rise with income, unskilled workers with families may face effective marginal tax rates as high as 90 percent because of the earned income tax credit and means-tested welfare programs, such as Medicaid (Blundell and MaCurdy 1999). As a result unskilled workers may have a greater incentive to leave high-wage areas than skilled workers, which could cause a shortage of low-skilled workers in high-wage cities.

If productivity differences affect only one type of worker equation (A.24c) becomes

$$c_X(w^a/A_X^a, w^b, r) = 1$$

Log-linearized this is

$$\theta_N^a \hat{w}^a + \theta_N^b \hat{w}^b + \theta_L \hat{r} = \theta_N^a \hat{A}_X^a$$

the price differentials in (A.26) and (A.27) remain unchanged once $\hat{A}_X$ is replaced with $\theta_N^a \hat{A}_X^a$, the effective cost-reduction from an increase in type-a's productivity. The level of relative employment in (A.28) must be amended to

$$\hat{N}^a - \hat{N}^b = -\sigma_X\left(\hat{w}^a - \hat{w}^a\right) + (\sigma_X - 1)\,\hat{A}_X^a$$

If $\sigma_X > 1$ then cities with $\hat{A}_X^a > 0$ hire relatively more type-a workers than wage differentials alone imply.

D.4 Mobile and Immobile Workers

In the short-to-medium run, unskilled workers are generally less mobile than skilled workers (Bound and Holzer 2000). For greater insight, consider the case where a-types are mobile and b-types are fully immobile, distributed according to some pattern across cities. Furthermore, let $A_Y = 1$, $\phi_L = 1$ and $\theta_L = \theta_K = 0$, so that the following equations hold

$$e^a\left(r, \bar{u}^a\right)/Q^a = w^a + R^a - \tau^a$$
$$c_X(w^a/A_X^a, w^b/A_X^b) = 1$$
$$N^a y^a + N^b y^b = L$$
$$\frac{\partial c_X/\partial w^a}{\partial c_X/\partial w^b} = \frac{A_X^a N^a}{A_X^b N^b}$$

The welfare of b-types is given implicitly by $e^b(r, u^b)/Q^b = w^b + R^b - \tau^b$ where u^b is endogenous. Log-linearizing these conditions, we have

$$s_w^a \hat{w}^a - s_y^a \hat{r} = -\hat{Q}^a + dT^a/m^a \tag{A.29a}$$
$$\theta_N^a \hat{w}^a + \theta_N^b \hat{w}^b = \theta_N^a \hat{A}_X^a + \theta_N^b \hat{A}_X^b \tag{A.29b}$$
$$\hat{N}^a + \sigma_X\left(\hat{w}^a - \hat{w}^b\right) = (\sigma_X - 1)\left(\hat{A}^a - \hat{A}^b\right) \tag{A.29c}$$
$$\mu^a \hat{N}^a + \mu^b s_w^b \hat{w}^b - \left[\mu^a s_x^a \sigma_D^a + \mu^b\left(s_y^b + s_x^b \sigma_D^b\right)\right]\hat{r} = \mu^a \hat{Q}^a + \mu^b dT^b/m^b \tag{A.29d}$$

The left-hand side of the (A.29d) can be rewritten as $\mu^a \hat{N}^a + \mu^b s_w^b \hat{w}^b + \left(\mu^a s_y^a - |\eta^u|\right)\hat{r}$ where

$$\eta^u = -\left[\mu^a\left(s_y^a + s_x^a \sigma_D^a\right) + \mu^b\left(s_y^b + s_x^b \sigma_D^b\right)\right]$$

is the uncompensated own-price demand elasticity for home-goods.

To simplify further assume tastes are homogenous ($s_y^a = s_y^b = s_y$) that each type of worker gets the same share of income from wages ($s_w^a = s_w^b = s_x$) and that productivity differences are neutral

$(A_X^a = A_X^b = A_X)$ Solving the above conditions then yields

$$\hat{w}^a = \frac{-\left|\eta^u\right|\hat{Q}^a + s_y\left(\frac{\theta_N^a}{\theta_N^b}\sigma_X + s_x\right)\hat{A}_X + \left(\left|\eta^c\right| + s_y\theta_N^b\right)\frac{dT^a}{m^a} - s_y\theta_N^b\frac{dT^b}{m^b}}{s_x\left|\eta^u\right| + s_y\frac{\theta_N^a}{\theta_N^b}\sigma_X} \tag{A.30a}$$

$$\hat{w}^b = \frac{\left|\eta^u\right|\hat{Q}^a + \left(\frac{s_x\left|\eta^u\right|}{\theta_N^a} + s_y\left(\sigma_X - 1\right)\right)\hat{A}_X - \left(\left|\eta^c\right| + s_y\theta_N^b\right)\frac{dT^a}{m^a} + s_y\theta_N^b\frac{dT^b}{m^b}}{s_x\frac{\theta_N^b}{\theta_N^a}\left|\eta^u\right| + s_y\sigma_X} \tag{A.30b}$$

$$\hat{r} = \frac{\theta_N^a\sigma_X\hat{Q}^a + s_x\left(\theta_N^a\sigma_X + \theta_N^b\right)\hat{A}_X - \theta_N^a\left(\theta_N^b + \sigma_X\right)\frac{dT^a}{m^a} - s_x\left(\theta_N^b\right)^2\frac{dT^b}{m^b}}{s_x\theta_N^b\left|\eta^u\right| + s_y\theta_N^a\sigma_X} \tag{A.30c}$$

$$\hat{N}^a = \sigma_X\frac{\left|\eta^u\right|\hat{Q}^a + s_x\left|\eta^c\right|\hat{A}_X - \left(\left|\eta^c\right| + s_y\theta_N^b\right)\frac{dT^a}{m^a} + s_y\theta_N^b\frac{dT^b}{m^b}}{s_x\theta_N^b\left|\eta^u\right| + s_y\theta_N^a\sigma_X} \tag{A.30d}$$

Similar to the case with two mobile-worker types, an improvement in the quality-of-life for mobile workers, Q^a, draws in more of these workers, lowering their wages, and raising the wages of immobile workers as well as local prices. However, the quality-of-life for immobile workers, Q^b, has no impact on prices. Higher overall productivity, A_X, draws in more workers and raises rents and wages for both types, unless $s_x\left|\eta^u\right| < s_y\theta_N^a(1 - \sigma_X)$, which seems unlikely: even if $\sigma_X = 0$, this would require $\theta_N^a > \left|\eta^u\right|s_x/s_y$, where the left-hand side is bounded above by one, while the right-hand side is calibrated at two.

Higher taxes on mobile workers, dT^a, causes them to leave, with the remaining mobile workers paid more in equilibrium, while immobile workers are paid less. A subtle effect occurs with higher taxes on immobile workers, dT^b, as this lowers rents in the city, attracting mobile workers who are willing to take lower wages, thus raising the wages of immobile workers.

The welfare of mobile workers is set nationally by the outside reservation utility $\bar{u}^a$, but the welfare of immobile workers is set locally by their change in real income:

$$\frac{d[m^b - e(r, u^b; Q^b)]}{m^b} = \hat{Q}^b + \frac{\left(s_x\left|\eta^u\right| - s_y\sigma_X\right)\theta_N^a\hat{Q}^a + \left(s_x\left|\eta^u\right| - s_y\right)\hat{A}_X}{s_x\theta_N^b\left|\eta^u\right| + s_y\theta_N^a\sigma_X}$$
$$+ \frac{\left(s_y\sigma_X - s_x\left|\eta^c\right|\right)\theta_N^a\frac{dT^a}{m^a} - \left(s_x\theta_N^b\left|\eta^c\right| + s_y\theta_N^a\sigma_X\right)\frac{dT^b}{m^b}}{s_x\theta_N^b\left|\eta^u\right| + s_y\theta_N^a\sigma_X}$$

These results show that immobile types are not necessarily made better off by improvements in overall productivity or by an improved environment for mobile workers, as these raise both rents and wages of immobile workers. Above-averages taxes on immobile workers, which should occur in cities where A_X or Q^a is high or Q^b is low, will certainly make immobile workers worse off, with only a fraction of these taxes being passed on to land. If productivity differences are large, so that $\hat{A}_X$ tends to vary more than $\hat{Q}^a$, or substitutability of labor, σ_X, is high, then wage differentials of mobile and immobile will be highly correlated.

Taxes on mobile workers lower the welfare of immobile workers if $s_x\left|\eta^c\right| > s_y\sigma_X$ in which case wage losses dominate the reduction in local prices. When mobile workers leave, immobile workers' wages typically fall, although so do home-good prices. It is possible for the real incomes of immobile workers to rise if mobile and immobile workers are sufficiently substitutable in pro-

duction. However, if these workers are highly substitutable, immobile workers' wages will be high where mobile workers' wages are high, meaning that they too will pay higher federal taxes. Since these taxes are only partly capitalized into home-good prices, immobile workers are likely worse off in high-wage areas.

The main results in the text hold if workers are identical ($\sigma_X \to \infty$) but only a subset of workers are fully mobile. This case yields $\hat{w}^a = \hat{w}^b = \hat{A}_X$, with $\hat{r} = (\hat{Q}^a + s_x \hat{A}_X - \frac{dT^a}{m^a})/s_y$, the appropriate simplifications of the formulas in (5) and (8a).

D.5 Agglomeration Economies

Returning to the one-worker type case, suppose that because of agglomeration economies, productivity depends on the number of workers producing the traded good: $A_X^j = A_X^{0j}(N^j)^\gamma$, where γ measures the percent increase in productivity from a percent increase in a city's population. Amending condition (4b) to include these economies

$$\theta_N \hat{w} + \theta_L \hat{r} = \hat{A}_X^0 + \gamma \hat{N}_X$$

Introducing an endogenous quantity differential, $\hat{N}_X$, into the initial system of equations (4) determining price differentials, makes the model considerably harder to solve. To make matters simple, assume $\theta_N = 1$, $\phi_L = 1$ and consider only the effects of a head tax, so $p = r$, and $w = A_X$. In this case, the wage and price differentials are

$$d\hat{w} = -\frac{\gamma s_x \sigma_D}{s_R - \gamma s_x^2 \sigma_D} \frac{dT}{m}$$

$$d\hat{r} = -\frac{1}{s_R - \gamma s_x^2 \sigma_D} \frac{dT}{m}$$

Stability requires $s_R > \gamma s_x^2 \sigma_D$. Comparing these to the case where $\gamma = 0$, agglomeration effects imply that higher tax burdens lower local wages as local productivity falls when workers leave. Even if $\theta_L > 0$, if γ is sufficiently larger than θ_L, this productivity loss can dominate the wage increase due to substitution towards land. Land rent and home-good price changes are still negative and even larger with agglomeration economies.[29]

D.6 Heterogeneous Export Goods

The model assumes that all traded goods are homogenous, when in fact cities may specialize in different types of export production. If exported goods are not perfect substitutes in consumption, cities may not be price-takers in their own exported good, and differential taxes may raise the relative price of goods produced in high-wage cities. In this way, higher differential taxes may be passed on to consumers across the country.[30] For example, if firms in Detroit exclusively provide cars to the rest of the country, they may be able to raise the price of cars to pass on the costs of

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[29]As agglomeration economies come from externalities, cities in the absence of taxes may not be of optimal size. Depending on the type of externality and how the market operates, federal taxes may help or hinder cities from attaining their optimal size.

[30]A related analysis with local taxes is found in Wildasin (1986, pp. 103-105).

having to pay their workers higher wages because of taxes. By changing relative prices, federal taxes may induce consumers to overconsume goods produced in low-wage, under-taxed areas.

TABLE A1: LIST OF METROPOLITAN AND NON-METROPOLITAN AREAS BY TOTAL TAX DIFFERENTIAL, 2000

Full Name of Metropolitan Area	Pop Size	Adjusted Differentials			Fed Spend	Federal Tax Differential				State Tax Differential	Total Tax Differential	Total Tax Rank
		Wage	Hous Cost	QOL		Wage Effect	Deduction Effects		Total Federal			
							Partial Index	QOL Income				
San Francisco–Oakland–San Jose, CA CMSA	7,039,362	0.260	0.746	0.132	0.011	0.068	-0.012	0.005	0.061	0.007	0.068	1
New York–Northern New Jersey–Long Island, NY–NJ–CT–PA CMSA	21,199,864	0.209	0.423	0.042	-0.003	0.054	-0.007	0.002	0.049	0.004	0.053	2
Detroit–Ann Arbor–Flint, MI CMSA	5,456,428	0.134	0.089	-0.036	-0.009	0.035	-0.001	-0.001	0.032	0.004	0.036	3
Chicago–Gary–Kenosha, IL–IN–WI CMSA	9,157,540	0.136	0.219	0.009	0.001	0.035	-0.003	0.000	0.032	0.004	0.036	4
Hartford, CT MSA	1,183,110	0.150	0.147	-0.029	0.003	0.039	-0.002	-0.001	0.036	0.000	0.036	5
Boston–Worcester–Lawrence, MA–NH–ME–CT CMSA	5,819,100	0.136	0.349	0.052	0.000	0.035	-0.005	0.002	0.032	0.002	0.033	6
Washington–Baltimore, DC–MD–VA–WV CMSA	7,608,070	0.130	0.165	-0.009	0.006	0.034	-0.003	-0.001	0.031	0.002	0.033	7
Philadelphia–Wilmington–Atlantic City, PA–NJ–DE–MD CMSA	6,188,463	0.117	0.068	-0.036	0.003	0.030	-0.001	-0.001	0.028	0.002	0.030	8
Los Angeles–Riverside–Orange County, CA CMSA	16,373,645	0.127	0.399	0.073	-0.003	0.033	-0.006	0.003	0.030	0.000	0.029	9
Minneapolis–St. Paul, MN–WI MSA	2,968,806	0.088	0.055	-0.021	-0.019	0.023	-0.001	-0.001	0.021	0.007	0.028	10
non-metropolitan areas, CT	1,350,818	0.108	0.136	-0.012	-0.012	0.028	-0.002	0.000	0.026	-0.002	0.023	.
Atlanta, GA MSA	4,112,198	0.078	0.016	-0.032	-0.018	0.020	0.000	-0.001	0.019	0.004	0.023	11
Santa Barbara–Santa Maria–Lompoc, CA MSA	399,347	0.108	0.665	0.176	-0.011	0.028	-0.010	0.006	0.024	-0.002	0.022	12
Kokomo, IN MSA	101,541	0.073	-0.239	-0.120	-0.008	0.019	0.004	-0.004	0.018	0.004	0.022	13
Las Vegas, NV–AZ MSA	1,563,282	0.088	0.066	-0.023	0.000	0.023	-0.001	-0.001	0.021	0.001	0.022	14
Seattle–Tacoma–Bremerton, WA CMSA	3,554,760	0.082	0.277	0.056	-0.008	0.021	-0.004	0.002	0.019	0.001	0.020	15
Houston–Galveston–Brazoria, TX CMSA	4,669,571	0.072	-0.075	-0.063	-0.002	0.019	0.001	-0.002	0.018	0.002	0.020	16
Dallas–Fort Worth, TX CMSA	5,221,801	0.071	0.009	-0.033	-0.009	0.019	0.000	-0.001	0.017	0.002	0.019	17
Stockton–Lodi, CA MSA	563,598	0.087	0.107	-0.011	-0.007	0.023	-0.002	0.000	0.020	-0.002	0.018	18
Anchorage, AK MSA	260,283	0.070	0.184	0.028	0.056	0.018	-0.003	0.001	0.016	0.000	0.016	19
Salinas, CA MSA	401,762	0.085	0.533	0.140	-0.015	0.022	-0.008	0.005	0.019	-0.003	0.016	20
Milwaukee–Racine, WI CMSA	1,689,572	0.044	0.038	-0.005	-0.001	0.012	-0.001	0.000	0.011	0.005	0.016	21
Cincinnati–Hamilton, OH–KY–IN CMSA	1,979,202	0.041	-0.064	-0.041	-0.010	0.011	0.001	-0.002	0.010	0.004	0.014	22
Denver–Boulder–Greeley, CO CMSA	2,581,506	0.046	0.204	0.050	-0.014	0.012	-0.003	0.002	0.011	0.002	0.012	23
non-metropolitan areas, RI	258,023	0.047	0.181	0.040	-0.006	0.012	-0.003	0.002	0.011	0.001	0.012	.
Sacramento–Yolo, CA CMSA	1,796,857	0.066	0.183	0.026	-0.006	0.017	-0.003	0.001	0.015	-0.004	0.012	24
West Palm Beach–Boca Raton, FL MSA	1,131,184	0.036	0.146	0.035	-0.018	0.009	-0.002	0.001	0.008	0.002	0.010	25
Portland–Salem, OR–WA CMSA	2,265,223	0.033	0.167	0.045	-0.002	0.009	-0.003	0.002	0.008	0.003	0.010	26
Phoenix–Mesa, AZ MSA	3,251,876	0.031	0.096	0.020	-0.006	0.008	-0.002	0.001	0.007	0.002	0.010	27
Memphis, TN–AR–MS MSA	1,135,614	0.023	-0.104	-0.046	0.004	0.006	0.002	-0.002	0.006	0.004	0.009	28
non-metropolitan areas, AK	367,124	0.040	0.096	0.013	0.037	0.010	-0.002	0.001	0.009	0.000	0.009	.
San Diego, CA MSA	2,813,833	0.061	0.441	0.119	0.010	0.016	-0.007	0.004	0.013	-0.004	0.009	29
Modesto, CA MSA	446,997	0.054	0.034	-0.021	-0.012	0.014	-0.001	-0.001	0.013	-0.004	0.009	30
Rochester, MN MSA	124,277	0.022	-0.159	-0.065	0.031	0.006	0.002	-0.002	0.006	0.003	0.009	31
Raleigh–Durham–Chapel Hill, NC MSA	1,187,941	0.018	0.049	0.012	0.028	0.005	-0.001	0.000	0.004	0.004	0.009	32
Richland–Kennewick–Pasco, WA MSA	191,822	0.033	-0.104	-0.054	0.011	0.009	0.002	-0.002	0.008	0.000	0.008	33
Columbus, OH MSA	1,540,157	0.025	-0.046	-0.028	-0.001	0.007	0.001	-0.001	0.006	0.002	0.008	34
Charlotte–Gastonia–Rock Hill, NC–SC MSA	1,499,293	0.014	-0.018	-0.009	-0.007	0.004	0.000	0.000	0.003	0.004	0.008	35
Kansas City, MO–KS MSA	1,776,062	0.006	-0.094	-0.031	-0.001	0.002	0.001	-0.001	0.002	0.006	0.007	36
Bloomington–Normal, IL MSA	150,433	0.029	-0.090	-0.070	-0.018	0.008	0.002	-0.003	0.007	-0.001	0.007	37
Indianapolis, IN MSA	1,607,486	0.019	-0.090	-0.040	-0.010	0.005	0.001	-0.001	0.005	0.002	0.007	38
Austin–San Marcos, TX MSA	1,249,763	0.017	0.116	0.033	0.006	0.004	-0.002	0.001	0.004	0.001	0.005	39
Reno, NV MSA	339,486	0.026	0.198	0.056	0.001	0.007	-0.003	0.002	0.006	-0.001	0.005	40
St. Louis, MO–IL MSA	2,603,607	0.005	-0.094	-0.033	0.000	0.001	0.001	-0.001	0.002	0.003	0.005	41
Cleveland–Akron, OH CMSA	2,945,831	0.012	-0.037	-0.018	-0.012	0.003	0.001	-0.001	0.003	0.002	0.005	42
Janesville–Beloit, WI MSA	152,307	-0.002	-0.151	-0.050	-0.001	0.000	0.002	-0.002	0.000	0.003	0.003	43
Allentown–Bethlehem–Easton, PA MSA	637,958	0.006	-0.080	-0.031	-0.013	0.002	0.001	-0.001	0.002	0.001	0.003	44
Richmond–Petersburg, VA MSA	996,512	0.006	-0.088	-0.033	-0.007	0.002	0.001	-0.001	0.002	0.001	0.003	45
Birmingham, AL MSA	921,106	-0.008	-0.117	-0.034	0.004	-0.002	0.002	-0.001	-0.002	0.003	0.002	46
non-metropolitan areas, NV	285,196	0.012	-0.013	-0.012	0.016	0.003	0.000	0.000	0.003	-0.001	0.002	.
Reading, PA MSA	373,638	0.000	-0.161	-0.056	-0.017	0.000	0.003	-0.002	0.000	0.001	0.001	47
Providence–Fall River–Warwick, RI–MA MSA	1,188,613	0.012	-0.005	-0.010	0.003	0.003	0.000	0.000	0.003	-0.001	0.001	48
Bakersfield, CA MSA	661,645	0.026	-0.141	-0.070	-0.001	0.007	0.002	-0.003	0.007	-0.005	0.001	49

TABLE A1: LIST OF METROPOLITAN AND NON-METROPOLITAN AREAS BY TOTAL TAX DIFFERENTIAL, 2000

Full Name of Metropolitan Area	Pop Size	Adjusted Differentials Wage	Adjusted Differentials Hous Cost	Adjusted Differentials QOL	Fed Spend	Federal Tax Differential Wage Effect	Federal Tax Differential Deduction Effects Partial Index	Federal Tax Differential Deduction Effects QOL Income	Federal Tax Differential QOL Income	Federal Tax Differential Total Federal	State Tax Differential	Total Tax Differential	Total Tax Rank
Des Moines, IA MSA	456,022	-0.019	-0.074	-0.011	0.015	-0.005	0.001	0.000	0.000	-0.004	0.005	0.001	50
Grand Rapids--Muskegon--Holland, MI MSA	1,088,514	0.006	-0.121	-0.048	-0.016	0.002	0.002	-0.002	-0.002	0.002	-0.001	0.001	51
Lansing--East Lansing, MI MSA	447,728	0.005	-0.119	-0.046	0.027	0.001	0.002	-0.002	-0.002	0.002	-0.001	0.000	52
Rockford, IL MSA	371,236	0.004	-0.201	-0.075	-0.015	0.001	0.003	-0.003	-0.003	0.002	-0.002	0.000	53
Harrisburg--Lebanon--Carlisle, PA MSA	629,401	-0.007	-0.113	-0.036	0.023	-0.002	0.002	-0.001	-0.001	-0.001	0.001	-0.001	54
Miami--Fort Lauderdale, FL CMSA	3,876,380	-0.008	0.128	0.051	0.015	-0.002	-0.002	0.002	0.002	-0.002	0.002	-0.001	55
Nashville, TN MSA	1,231,311	-0.015	-0.030	-0.001	-0.005	-0.004	0.001	0.000	0.000	-0.004	0.001	-0.002	56
Naples, FL MSA	251,377	-0.009	0.287	0.107	-0.010	-0.002	-0.004	0.004	0.004	-0.003	0.001	-0.002	57
Lancaster, PA MSA	470,658	-0.012	-0.074	-0.019	-0.014	-0.003	0.001	-0.001	-0.001	-0.003	0.000	-0.002	58
Honolulu, HI MSA	876,156	-0.005	0.493	0.178	0.011	-0.001	-0.008	0.006	0.006	-0.003	0.000	-0.002	59
Green Bay, WI MSA	226,778	-0.018	-0.062	-0.010	-0.017	-0.005	0.001	0.000	0.000	-0.004	0.002	-0.002	60
Barnstable--Yarmouth, MA MSA	162,582	0.011	0.295	0.094	-0.003	0.003	-0.005	0.003	0.003	0.002	-0.005	-0.003	61
San Luis Obispo--Atascadero-Paso Robles, CA MSA	246,681	0.019	0.400	0.125	-0.017	0.005	-0.006	0.005	0.005	0.003	-0.007	-0.003	62
Salt Lake City--Ogden, UT MSA	1,333,914	-0.023	0.018	0.021	0.002	-0.006	0.000	0.001	0.001	-0.006	0.002	-0.004	63
Dayton--Springfield, OH MSA	950,558	-0.018	-0.124	-0.034	-0.004	-0.005	0.002	-0.001	-0.001	-0.004	0.000	-0.004	64
Saginaw--Bay City--Midland, MI MSA	403,070	-0.010	-0.213	-0.072	-0.003	-0.003	0.003	-0.003	-0.003	-0.002	-0.002	-0.004	65
non-metropolitan areas, MA	569,691	0.005	0.085	0.022	-0.007	0.001	-0.001	0.001	0.001	0.001	-0.005	-0.004	.
Jackson, MI MSA	158,422	-0.015	-0.227	-0.075	-0.006	-0.004	0.004	-0.003	-0.003	-0.003	-0.002	-0.005	66
York, PA MSA	381,751	-0.024	-0.162	-0.045	-0.019	-0.006	0.003	-0.002	-0.002	-0.005	0.000	-0.005	67
non-metropolitan areas, NH	1,011,597	-0.022	0.018	0.019	0.002	-0.006	0.000	0.001	0.001	-0.005	0.000	-0.005	.
Toledo, OH MSA	618,203	-0.024	-0.153	-0.041	-0.006	-0.006	0.002	-0.002	-0.002	-0.005	0.000	-0.005	68
Albany--Schenectady--Troy, NY MSA	875,583	-0.004	-0.062	-0.024	0.032	-0.001	0.001	-0.001	-0.001	-0.001	-0.005	-0.006	69
Huntsville, AL MSA	342,376	-0.038	-0.234	-0.060	-0.004	-0.010	0.004	-0.002	-0.002	-0.009	0.002	-0.006	70
Kalamazoo--Battle Creek, MI MSA	452,851	-0.018	-0.185	-0.058	-0.002	-0.005	0.003	-0.002	-0.002	-0.004	-0.002	-0.006	71
Peoria--Pekin, IL MSA	347,387	-0.020	-0.220	-0.070	-0.006	-0.005	0.003	-0.003	-0.003	-0.004	-0.003	-0.007	72
Springfield, MA MSA	591,932	-0.006	-0.022	-0.010	-0.002	-0.002	0.000	0.000	0.000	-0.002	-0.005	-0.007	73
Louisville, KY--IN MSA	1,025,598	-0.041	-0.128	-0.021	-0.006	-0.011	0.002	-0.001	-0.001	-0.009	0.002	-0.007	74
Beaumont--Port Arthur, TX MSA	385,090	-0.034	-0.343	-0.103	-0.011	-0.009	0.005	-0.004	-0.004	-0.007	0.000	-0.007	75
Yakima, WA MSA	222,581	-0.027	-0.076	-0.014	0.004	-0.007	0.001	-0.001	-0.001	-0.006	-0.001	-0.008	76
Baton Rouge, LA MSA	602,894	-0.043	-0.151	-0.029	0.010	-0.011	0.002	-0.001	-0.001	-0.010	0.002	-0.008	77
Madison, WI MSA	426,526	-0.036	0.099	0.056	0.026	-0.010	-0.002	0.002	0.002	-0.009	0.001	-0.008	78
Rochester, NY MSA	1,098,201	-0.014	-0.091	-0.030	-0.002	-0.004	0.001	-0.001	-0.001	-0.003	-0.005	-0.008	79
non-metropolitan areas, HI	335,651	-0.029	0.288	0.117	0.008	-0.008	-0.004	0.004	0.004	-0.008	-0.001	-0.009	.
Pittsburgh, PA MSA	2,358,695	-0.037	-0.171	-0.042	0.013	-0.010	0.003	-0.002	-0.002	-0.008	0.000	-0.009	80
Greensboro--Winston-Salem--High Point, NC MSA	1,251,509	-0.044	-0.129	-0.021	-0.004	-0.012	0.002	-0.001	-0.001	-0.010	0.001	-0.009	81
Orlando, FL MSA	1,644,561	-0.040	-0.029	0.012	-0.014	-0.010	0.000	0.000	0.000	-0.010	0.001	-0.009	82
non-metropolitan areas, MD	666,998	-0.018	-0.111	-0.035	0.020	-0.005	0.002	-0.001	-0.001	-0.004	-0.005	-0.009	.
Omaha, NE--IA MSA	716,998	-0.066	-0.140	-0.008	-0.003	-0.017	0.002	0.000	0.000	-0.015	0.006	-0.009	83
Appleton--Oshkosh--Neenah, WI MSA	358,365	-0.045	-0.133	-0.022	-0.024	-0.012	0.002	-0.001	-0.001	-0.010	0.000	-0.010	84
Wichita, KS MSA	545,220	-0.063	-0.245	-0.049	-0.004	-0.016	0.004	-0.002	-0.002	-0.014	0.004	-0.011	85
Merced, CA MSA	210,554	-0.013	-0.070	-0.026	-0.017	-0.003	0.001	-0.001	-0.001	-0.003	-0.008	-0.011	86
Santa Fe, NM MSA	147,635	-0.060	0.254	0.126	0.033	-0.016	-0.004	0.005	0.005	-0.015	0.004	-0.011	87
Fort Wayne, IN MSA	502,141	-0.048	-0.255	-0.065	-0.010	-0.013	0.004	-0.002	-0.002	-0.011	0.000	-0.011	88
Greenville--Spartanburg--Anderson, SC MSA	962,441	-0.057	-0.154	-0.022	-0.011	-0.015	0.002	-0.001	-0.001	-0.013	0.002	-0.011	89
Buffalo--Niagara Falls, NY MSA	1,170,111	-0.027	-0.170	-0.052	0.002	-0.007	0.003	-0.002	-0.002	-0.006	-0.006	-0.012	90
Fresno, CA MSA	922,516	-0.017	-0.057	-0.019	-0.004	-0.004	0.001	-0.001	-0.001	-0.004	-0.008	-0.012	91
Decatur, AL MSA	145,867	-0.061	-0.312	-0.076	-0.012	-0.016	0.005	-0.003	-0.003	-0.014	0.002	-0.012	92
Provo--Orem, UT MSA	368,536	-0.053	-0.046	0.013	-0.003	-0.014	0.001	0.001	0.001	-0.013	0.001	-0.012	93
Lexington, KY MSA	479,198	-0.061	-0.102	-0.002	0.016	-0.016	0.002	0.000	0.000	-0.014	0.002	-0.012	94
Lake Charles, LA MSA	183,577	-0.062	-0.286	-0.067	-0.005	-0.016	0.004	-0.002	-0.002	-0.014	0.001	-0.013	95
Tulsa, OK MSA	803,235	-0.080	-0.180	-0.016	-0.011	-0.021	0.003	-0.001	-0.001	-0.019	0.005	-0.014	96
Tampa--St. Petersburg--Clearwater, FL MSA	2,395,997	-0.058	-0.054	0.012	-0.016	-0.015	0.001	0.000	0.000	-0.014	0.000	-0.014	97
Portland, ME MSA	243,537	-0.077	0.045	0.063	-0.011	-0.020	-0.001	0.002	0.002	-0.019	0.005	-0.014	98

TABLE A1: LIST OF METROPOLITAN AND NON-METROPOLITAN AREAS BY TOTAL TAX DIFFERENTIAL, 2000

Full Name of Metropolitan Area	Pop Size	Adjusted Differentials Wage	Adjusted Differentials Hous Cost	Adjusted Differentials QOL	Fed Spend	Wage Effect	Federal Tax Differential Deduction Effects Partial Index	Federal Tax Differential Deduction Effects QOL Income	Federal Tax Differential Total Federal	State Tax Differential	Total Tax Differential	Total Tax Rank
South Bend, IN MSA	265,559	-0.058	-0.219	-0.047	-0.009	-0.015	0.003	-0.002	-0.013	-0.001	-0.014	99
Fort Collins--Loveland, CO MSA	251,494	-0.053	0.115	0.068	-0.014	-0.014	-0.002	0.003	-0.013	-0.001	-0.014	100
Sheboygan, WI MSA	112,646	-0.062	-0.172	-0.028	-0.024	-0.016	0.003	-0.001	-0.014	0.000	-0.015	101
Macon, GA MSA	322,549	-0.058	-0.267	-0.066	-0.007	-0.015	0.004	-0.002	-0.013	-0.002	-0.015	102
Syracuse, NY MSA	732,117	-0.038	-0.234	-0.069	-0.005	-0.010	0.004	-0.003	-0.009	-0.006	-0.015	103
Boise City, ID MSA	432,345	-0.082	-0.114	0.008	0.005	-0.021	0.002	0.000	-0.019	0.004	-0.016	104
Columbia, SC MSA	536,691	-0.072	-0.127	-0.005	0.007	-0.019	0.002	0.000	-0.017	0.001	-0.016	105
Cedar Rapids, IA MSA	191,701	-0.079	-0.127	0.000	-0.010	-0.021	0.002	0.002	-0.019	0.003	-0.016	106
Decatur, IL MSA	114,706	-0.055	-0.343	-0.097	-0.024	-0.014	0.005	-0.004	-0.012	-0.004	-0.016	107
Albuquerque, NM MSA	712,738	-0.082	0.009	0.050	0.017	-0.021	0.000	0.002	-0.020	0.003	-0.016	108
New Orleans, LA MSA	1,337,726	-0.073	-0.068	0.016	-0.009	-0.019	0.001	0.001	-0.017	0.001	-0.017	109
Visalia--Tulare--Porterville, CA MSA	368,021	-0.032	-0.118	-0.033	-0.009	-0.008	0.002	-0.001	-0.008	-0.009	-0.017	110
non-metropolitan areas, CA	1,249,739	-0.030	0.104	0.044	0.005	-0.008	-0.002	0.002	-0.008	-0.009	-0.017	.
Lafayette, IN MSA	182,821	-0.067	-0.129	-0.011	0.032	-0.017	0.002	0.000	-0.016	-0.001	-0.017	111
Jacksonville, FL MSA	1,100,491	-0.071	-0.091	0.006	0.006	-0.019	0.001	0.000	-0.017	0.000	-0.017	112
Savannah, GA MSA	293,000	-0.064	-0.027	0.022	-0.006	-0.017	0.000	0.001	-0.015	-0.002	-0.018	113
Iowa City, IA MSA	111,006	-0.084	-0.051	0.030	0.020	-0.022	0.001	0.001	-0.020	0.002	-0.018	114
Augusta--Aiken, GA--SC MSA	477,441	-0.072	-0.249	-0.051	-0.011	-0.019	0.004	-0.002	-0.017	-0.001	-0.018	115
Sarasota--Bradenton, FL MSA	589,959	-0.072	0.112	0.078	-0.023	-0.019	-0.002	0.003	-0.017	0.000	-0.018	116
non-metropolitan areas, CO	924,086	-0.065	0.173	0.094	0.010	-0.017	-0.003	0.003	-0.016	-0.002	-0.018	.
Jackson, TN MSA	107,377	-0.079	-0.273	-0.054	-0.018	-0.021	0.004	-0.002	-0.018	0.001	-0.018	117
Wausau, WI MSA	125,834	-0.074	-0.257	-0.052	-0.009	-0.019	0.004	-0.002	-0.017	-0.001	-0.018	118
Jackson, MS MSA	440,801	-0.092	-0.212	-0.022	0.009	-0.024	0.003	-0.001	-0.021	0.003	-0.018	119
Greenville, NC MSA	133,798	-0.079	-0.201	-0.029	0.006	-0.021	0.003	-0.001	-0.019	0.000	-0.019	120
Bellingham, WA MSA	166,814	-0.068	0.088	0.066	-0.005	-0.018	-0.001	0.002	-0.017	-0.002	-0.019	121
Davenport--Moline--Rock Island, IA--IL MSA	359,062	-0.079	-0.184	-0.023	-0.003	-0.021	0.003	-0.001	-0.019	-0.001	-0.019	122
Little Rock--North Little Rock, AR MSA	583,845	-0.100	-0.174	-0.004	0.011	-0.026	0.003	0.000	-0.023	0.004	-0.020	123
Canton--Massillon, OH MSA	406,934	-0.074	-0.199	-0.033	-0.013	-0.019	0.003	-0.001	-0.017	-0.002	-0.020	124
Youngstown--Warren, OH MSA	594,746	-0.075	-0.273	-0.059	-0.012	-0.020	0.004	-0.002	-0.018	-0.002	-0.020	125
Corpus Christi, TX MSA	380,783	-0.081	-0.182	-0.022	0.004	-0.021	0.003	-0.001	-0.019	-0.001	-0.020	126
Fort Pierce--Port St. Lucie, FL MSA	319,426	-0.086	-0.070	0.021	-0.028	-0.022	0.001	0.001	-0.021	-0.001	-0.021	127
non-metropolitan areas, DE	158,149	-0.077	-0.109	-0.001	-0.002	-0.020	0.002	0.000	-0.018	-0.003	-0.021	.
Houma, LA MSA	194,477	-0.093	-0.296	-0.055	-0.032	-0.024	0.005	-0.002	-0.022	0.000	-0.021	128
Albany, GA MSA	120,822	-0.081	-0.307	-0.068	-0.006	-0.021	0.005	-0.003	-0.019	-0.003	-0.021	129
non-metropolitan areas, MI	2,178,963	-0.073	-0.254	-0.056	-0.005	-0.019	0.004	-0.002	-0.017	-0.005	-0.022	.
Lima, OH MSA	155,084	-0.082	-0.326	-0.074	-0.003	-0.021	0.005	-0.003	-0.019	-0.003	-0.022	130
Springfield, IL MSA	201,437	-0.073	-0.194	-0.035	0.072	-0.019	0.003	-0.001	-0.017	-0.005	-0.022	131
Duluth--Superior, MN--WI MSA	243,815	-0.082	-0.323	-0.074	0.001	-0.021	0.005	-0.003	-0.019	-0.003	-0.022	132
Evansville--Henderson, IN--KY MSA	296,195	-0.087	-0.212	-0.030	0.000	-0.023	0.003	-0.001	-0.020	-0.002	-0.022	133
non-metropolitan areas, WA	1,063,531	-0.082	-0.021	0.034	0.016	-0.021	0.000	0.001	-0.020	-0.003	-0.022	.
San Antonio, TX MSA	1,592,383	-0.089	-0.187	-0.020	-0.005	-0.023	0.003	-0.001	-0.021	-0.001	-0.022	134
Colorado Springs, CO MSA	516,929	-0.083	0.035	0.054	-0.018	-0.022	-0.001	0.002	-0.020	-0.002	-0.022	135
Benton Harbor, MI MSA	162,453	-0.074	-0.187	-0.031	0.000	-0.019	0.003	-0.001	-0.018	-0.005	-0.022	136
Tuscaloosa, AL MSA	164,875	-0.097	-0.180	-0.011	0.002	-0.025	0.003	0.000	-0.023	0.000	-0.022	137
Chattanooga, TN--GA MSA	465,161	-0.092	-0.207	-0.025	-0.006	-0.024	0.003	-0.001	-0.022	-0.001	-0.022	138
Charleston--North Charleston, SC MSA	549,033	-0.094	0.012	0.054	0.003	-0.024	0.000	0.002	-0.023	0.000	-0.023	139
Dover, DE MSA	126,697	-0.083	-0.163	-0.016	0.003	-0.022	0.003	-0.001	-0.020	-0.003	-0.023	140
Lafayette, LA MSA	385,647	-0.099	-0.248	-0.035	-0.003	-0.026	0.004	-0.001	-0.023	0.000	-0.023	141
Champaign--Urbana, IL MSA	179,669	-0.079	-0.129	-0.009	0.026	-0.021	0.002	0.000	-0.019	-0.005	-0.024	142
non-metropolitan areas, IN	1,791,003	-0.096	-0.316	-0.063	0.003	-0.025	0.005	-0.002	-0.022	-0.002	-0.024	.
Spokane, WA MSA	417,939	-0.096	-0.144	-0.002	-0.007	-0.025	0.002	-0.001	-0.023	-0.003	-0.026	143
Tyler, TX MSA	174,706	-0.103	-0.198	-0.017	-0.013	-0.027	0.003	-0.001	-0.024	-0.002	-0.026	144
Oklahoma City, OK MSA	1,083,346	-0.123	-0.210	-0.005	-0.006	-0.032	0.003	0.000	-0.029	0.003	-0.026	145

		Adjusted Differentials				Federal Tax Differential				State Tax Differential			
							Deduction Effects					Total Tax	Total Tax
Full Name of Metropolitan Area	Pop Size	Wage	Hous Cost	QOL	Fed Spend	Wage Effect	Partial Index	QOL Income	Total Federal	QOL Income	State Tax Differential	Differential	Rank
Melbourne--Titusville--Palm Bay, FL MSA	476,230	-0.107	-0.153	0.002	-0.024	-0.028	0.002	0.000	-0.025	0.000	-0.001	-0.026	146
Fort Myers--Cape Coral, FL MSA	440,888	-0.106	0.014	0.061	-0.019	-0.028	0.000	0.002	-0.026	0.002	-0.001	-0.026	147
Rocky Mount, NC MSA	143,026	-0.106	-0.238	-0.029	0.008	-0.028	0.004	-0.001	-0.025	-0.001	-0.002	-0.027	148
non-metropolitan areas, OH	2,548,986	-0.099	-0.323	-0.065	-0.001	-0.026	0.005	-0.002	-0.023	-0.002	-0.004	-0.027	.
Scranton--Wilkes-Barre--Hazleton, PA MSA	624,776	-0.102	-0.246	-0.036	-0.001	-0.026	0.004	-0.001	-0.024	-0.001	-0.003	-0.027	149
Waco, TX MSA	213,517	-0.107	-0.278	-0.043	-0.017	-0.028	0.004	-0.002	-0.025	-0.002	-0.002	-0.027	150
Shreveport--Bossier City, LA MSA	392,302	-0.113	-0.266	-0.034	-0.006	-0.029	0.004	-0.001	-0.026	0.001	0.000	-0.027	151
Tallahassee, FL MSA	284,539	-0.108	-0.085	0.027	0.047	-0.028	0.001	0.001	-0.026	0.000	-0.001	-0.027	152
Knoxville, TN MSA	687,249	-0.113	-0.197	-0.010	0.003	-0.029	0.003	0.000	-0.027	0.000	0.000	-0.027	153
Mansfield, OH MSA	175,818	-0.101	-0.299	-0.056	0.007	-0.026	0.005	-0.002	-0.024	-0.002	-0.004	-0.027	154
Sioux Falls, SD MSA	172,412	-0.124	-0.180	0.005	-0.023	-0.032	0.003	0.000	-0.029	0.000	0.002	-0.027	155
Yuma, AZ MSA	160,026	-0.104	-0.148	0.001	0.012	-0.027	0.002	0.000	-0.025	0.000	-0.003	-0.027	156
Erie, PA MSA	280,843	-0.105	-0.269	-0.042	-0.008	-0.027	0.004	-0.002	-0.025	-0.001	-0.003	-0.027	157
Sioux City, IA--NE MSA	124,130	-0.122	-0.271	-0.030	0.018	-0.032	0.004	-0.001	-0.029	-0.001	0.001	-0.028	158
St. Cloud, MN MSA	167,392	-0.101	-0.300	-0.057	-0.021	-0.026	0.005	-0.002	-0.024	-0.002	-0.004	-0.028	159
Yuba City, CA MSA	139,149	-0.072	-0.100	-0.008	0.014	-0.019	0.002	0.000	-0.017	0.000	-0.011	-0.028	160
Lincoln, NE MSA	250,291	-0.131	-0.148	0.021	0.025	-0.034	0.002	0.001	-0.031	0.001	0.003	-0.028	161
Lakeland--Winter Haven, FL MSA	483,924	-0.117	-0.229	-0.020	-0.014	-0.030	0.004	-0.001	-0.028	-0.001	-0.001	-0.029	162
Muncie, IN MSA	118,769	-0.111	-0.274	-0.040	-0.002	-0.029	0.004	-0.002	-0.026	-0.002	-0.003	-0.029	163
Montgomery, AL MSA	333,055	-0.120	-0.183	-0.001	0.029	-0.031	0.003	0.000	-0.028	0.000	0.000	-0.029	164
Monroe, LA MSA	147,250	-0.120	-0.277	-0.034	-0.004	-0.031	0.004	-0.001	-0.028	-0.001	-0.001	-0.029	165
Roanoke, VA MSA	235,932	-0.107	-0.208	-0.020	-0.015	-0.028	0.003	-0.001	-0.025	-0.001	-0.004	-0.029	166
Biloxi--Gulfport--Pascagoula, MS MSA	363,988	-0.130	-0.230	-0.010	-0.013	-0.034	0.004	0.000	-0.030	0.000	0.002	-0.029	167
Waterloo--Cedar Falls, IA MSA	128,012	-0.129	-0.261	-0.023	-0.012	-0.033	0.004	-0.001	-0.030	-0.001	0.001	-0.029	168
Norfolk--Virginia Beach--Newport News, VA--NC MSA	1,569,541	-0.107	-0.067	0.030	-0.013	-0.028	0.001	0.001	-0.026	0.001	-0.004	-0.030	169
Tucson, AZ MSA	843,746	-0.112	-0.003	0.056	0.007	-0.029	0.000	0.002	-0.027	0.002	-0.003	-0.030	170
Mobile, AL MSA	540,258	-0.126	-0.221	-0.012	0.004	-0.033	0.003	0.000	-0.030	0.000	-0.001	-0.030	171
Auburn--Opelika, AL MSA	115,092	-0.126	-0.253	-0.023	-0.029	-0.033	0.004	-0.001	-0.030	-0.001	-0.001	-0.030	172
non-metropolitan areas, WI	1,866,585	-0.116	-0.252	-0.030	-0.004	-0.030	0.004	-0.001	-0.027	-0.001	-0.003	-0.030	.
Fayetteville--Springdale--Rogers, AR MSA	311,121	-0.139	-0.208	0.003	-0.014	-0.036	0.003	0.000	-0.033	0.000	0.002	-0.031	173
Gadsden, AL MSA	103,459	-0.131	-0.425	-0.081	0.012	-0.034	0.007	-0.003	-0.030	-0.003	-0.001	-0.031	174
Terre Haute, IN MSA	149,192	-0.120	-0.367	-0.069	-0.012	-0.031	0.006	-0.003	-0.028	-0.002	-0.003	-0.031	175
Odessa--Midland, TX MSA	237,132	-0.125	-0.343	-0.057	-0.036	-0.032	0.005	-0.002	-0.029	-0.001	-0.002	-0.031	176
non-metropolitan areas, SC	1,616,255	-0.126	-0.259	-0.026	-0.001	-0.033	0.004	-0.001	-0.030	0.000	-0.004	-0.031	.
Charlottesville, VA MSA	159,576	-0.113	-0.003	0.055	-0.003	-0.029	0.000	0.002	-0.027	-0.001	-0.003	-0.031	177
Eau Claire, WI MSA	148,337	-0.119	-0.258	-0.031	-0.011	-0.031	0.004	-0.001	-0.028	-0.001	-0.003	-0.031	178
Bloomington, IN MSA	120,563	-0.119	-0.097	0.027	0.029	-0.031	0.002	0.001	-0.029	0.001	-0.003	-0.032	179
Longview--Marshall, TX MSA	208,780	-0.126	-0.305	-0.043	0.017	-0.033	0.005	-0.002	-0.030	-0.002	-0.002	-0.032	180
Williamsport, PA MSA	120,044	-0.121	-0.288	-0.041	-0.013	-0.031	0.004	-0.002	-0.028	-0.002	-0.004	-0.032	181
Eugene--Springfield, OR MSA	322,959	-0.118	-0.360	-0.062	-0.002	-0.034	0.006	-0.002	-0.029	-0.002	-0.003	-0.032	182
La Crosse, WI--MN MSA	126,838	-0.121	-0.099	0.034	-0.009	-0.031	0.002	0.001	-0.029	0.000	-0.003	-0.032	183
Hickory--Morganton--Lenoir, NC MSA	341,851	-0.125	-0.190	-0.006	-0.019	-0.033	0.003	0.000	-0.030	0.000	-0.003	-0.032	184
Topeka, KS MSA	169,871	-0.139	-0.273	-0.008	0.038	-0.036	0.004	-0.001	-0.033	-0.001	0.000	-0.033	185
Florence, AL MSA	142,950	-0.136	-0.334	-0.022	0.013	-0.035	0.005	-0.002	-0.032	-0.002	-0.001	-0.033	186
non-metropolitan areas, GA	2,744,802	-0.124	-0.303	-0.047	0.006	-0.032	0.005	-0.002	-0.029	-0.002	-0.002	-0.034	.
non-metropolitan areas, PA	2,023,193	-0.129	-0.360	-0.046	-0.003	-0.034	0.006	-0.002	-0.030	-0.002	-0.004	-0.034	.
Bryan--College Station, TX MSA	152,415	-0.133	-0.099	-0.062	0.011	-0.035	0.002	-0.002	-0.032	0.001	-0.002	-0.034	187
Chico--Paradise, CA MSA	203,171	-0.091	0.024	0.084	-0.005	-0.024	0.000	0.001	-0.022	0.002	-0.012	-0.035	188
El Paso, TX MSA	679,622	-0.137	-0.308	0.034	0.003	-0.036	0.005	0.002	-0.032	-0.001	-0.003	-0.035	189
non-metropolitan areas, OR	1,194,699	-0.129	-0.022	0.045	0.002	-0.034	0.000	0.000	-0.031	0.002	-0.004	-0.035	.
non-metropolitan areas, UT	531,967	-0.132	-0.158	-0.038	0.002	-0.034	0.002	-0.001	-0.031	0.000	-0.003	-0.035	.
Fargo--Moorhead, ND--MN MSA	174,367	-0.159	-0.280	0.058	0.010	-0.041	0.004	0.002	-0.037	0.000	0.003	-0.035	190
Columbus, GA--AL MSA	274,624	-0.127	-0.213	0.012	-0.004	-0.033	0.003	0.000	-0.030	0.000	-0.005	-0.035	191

TABLE A1: LIST OF METROPOLITAN AND NON-METROPOLITAN AREAS BY TOTAL TAX DIFFERENTIAL, 2000

Full Name of Metropolitan Area	Pop Size	Adjusted Differentials			Fed Spend	Federal Tax Differential	Deduction Effects				State Tax Differential	Total Tax Differential	Total Tax Rank
		Wage	Hous Cost	QOL		Wage Effect	Partial Index	QOL Income	QOL Income	Total Federal			
Wilmington, NC MSA	233,450	-0.133	0.021	0.075	0.002	-0.034	0.000	0.003	0.003	-0.032	-0.003	-0.035	192
Binghamton, NY MSA	252,320	-0.109	-0.295	-0.056	-0.007	-0.028	0.005	-0.002	-0.002	-0.026	-0.010	-0.035	193
Redding, CA MSA	163,256	-0.096	-0.010	0.035	0.000	-0.025	0.000	0.001	0.001	-0.024	-0.013	-0.036	194
Glens Falls, NY MSA	124,345	-0.110	-0.197	-0.021	-0.001	-0.029	0.003	-0.001	-0.001	-0.026	-0.010	-0.036	195
State College, PA MSA	135,758	-0.134	-0.073	0.042	0.033	-0.035	0.001	0.002	0.002	-0.032	-0.004	-0.036	196
non-metropolitan areas, LA	1,415,540	-0.149	-0.420	-0.071	0.005	-0.039	0.007	-0.003	-0.003	-0.035	-0.001	-0.036	.
Amarillo, TX MSA	217,858	-0.143	-0.224	-0.005	-0.018	-0.037	0.003	0.000	0.000	-0.034	-0.002	-0.036	197
non-metropolitan areas, NY	1,744,930	-0.111	-0.216	-0.027	0.000	-0.029	0.003	-0.001	-0.001	-0.027	-0.010	-0.036	.
Lynchburg, VA MSA	214,911	-0.134	-0.297	-0.038	-0.011	-0.035	0.005	-0.001	-0.001	-0.032	-0.005	-0.036	198
Utica-Rome, NY MSA	299,896	-0.113	-0.333	-0.067	-0.008	-0.029	0.005	-0.002	-0.002	-0.027	-0.010	-0.037	199
Medford--Ashland, OR MSA	181,269	-0.135	0.072	0.094	-0.010	-0.035	-0.001	0.003	0.003	-0.033	-0.004	-0.037	200
Gainesville, FL MSA	217,955	-0.147	-0.121	0.034	-0.001	-0.038	0.002	0.001	0.001	-0.035	-0.002	-0.037	201
Athens, GA MSA	153,444	-0.134	-0.137	0.018	-0.003	-0.035	0.002	0.001	0.001	-0.032	-0.005	-0.037	202
Panama City, FL MSA	148,217	-0.150	-0.141	0.029	0.002	-0.039	0.002	0.001	0.001	-0.036	-0.002	-0.037	203
Johnson City--Kingsport--Bristol, TN--VA MSA	480,091	-0.155	-0.309	-0.028	0.000	-0.040	0.005	-0.001	-0.001	-0.037	-0.001	-0.038	204
non-metropolitan areas, KY	2,828,647	-0.154	-0.432	-0.072	-0.005	-0.040	0.007	-0.003	-0.003	-0.036	-0.002	-0.038	.
Flagstaff, AZ--UT MSA	122,366	-0.140	0.053	0.089	0.017	-0.036	-0.001	0.003	0.003	-0.034	-0.004	-0.038	205
Altoona, PA MSA	129,144	-0.146	-0.372	-0.058	0.023	-0.038	0.006	-0.002	-0.002	-0.034	-0.004	-0.039	206
Pensacola, FL MSA	412,153	-0.155	-0.201	0.010	-0.009	-0.040	0.003	0.000	0.000	-0.037	-0.002	-0.039	207
non-metropolitan areas, IL	2,202,549	-0.135	-0.369	-0.066	0.005	-0.035	0.006	-0.002	-0.002	-0.032	-0.007	-0.039	.
non-metropolitan areas, NC	2,632,956	-0.148	-0.242	-0.010	0.007	-0.039	0.004	0.000	0.000	-0.035	-0.004	-0.039	.
Sharon, PA MSA	120,293	-0.147	-0.325	-0.041	-0.002	-0.038	0.005	-0.002	-0.002	-0.035	-0.004	-0.039	208
Daytona Beach, FL MSA	493,175	-0.157	-0.148	0.030	-0.002	-0.041	0.002	0.001	0.001	-0.037	-0.002	-0.039	209
non-metropolitan areas, VT	608,387	-0.166	-0.068	0.065	-0.002	-0.043	0.001	0.002	0.002	-0.040	0.000	-0.040	.
Billings, MT MSA	129,352	-0.178	-0.256	0.007	-0.006	-0.046	0.004	0.000	0.000	-0.042	0.002	-0.040	210
non-metropolitan areas, WV	1,809,034	-0.172	-0.444	-0.065	0.014	-0.045	0.007	-0.002	-0.002	-0.040	0.000	-0.040	.
non-metropolitan areas, AL	1,504,381	-0.166	-0.469	-0.079	-0.002	-0.043	0.007	-0.003	-0.003	-0.039	-0.002	-0.041	.
Danville, VA MSA	110,156	-0.151	-0.399	-0.066	-0.003	-0.039	0.006	-0.002	-0.002	-0.035	-0.005	-0.041	211
St. Joseph, MO MSA	102,490	-0.164	-0.335	-0.033	0.011	-0.043	0.005	-0.001	-0.001	-0.039	-0.002	-0.041	212
Fort Smith, AR--OK MSA	207,290	-0.176	-0.334	-0.024	0.004	-0.046	0.005	-0.001	-0.001	-0.041	0.000	-0.041	213
Lubbock, TX MSA	242,628	-0.162	-0.239	-0.001	0.037	-0.042	0.004	0.000	0.000	-0.038	-0.003	-0.041	214
Alexandria, LA MSA	126,337	-0.167	-0.336	-0.031	-0.010	-0.044	0.005	-0.001	-0.001	-0.039	-0.002	-0.041	215
Ocala, FL MSA	258,916	-0.168	-0.274	-0.009	-0.015	-0.044	0.004	0.000	0.000	-0.040	-0.002	-0.042	216
Asheville, NC MSA	225,965	-0.156	-0.063	0.057	-0.004	-0.041	0.001	0.002	0.002	-0.038	-0.004	-0.042	217
Hattiesburg, MS MSA	111,674	-0.176	-0.346	-0.029	-0.010	-0.046	0.005	-0.001	-0.001	-0.042	-0.001	-0.042	218
Pueblo, CO MSA	141,472	-0.159	-0.246	-0.006	-0.001	-0.041	0.004	0.000	0.000	-0.038	-0.005	-0.042	219
Punta Gorda, FL MSA	141,627	-0.168	-0.083	0.058	-0.034	-0.044	0.001	0.002	0.002	-0.040	-0.002	-0.043	220
non-metropolitan areas, VA	1,640,567	-0.157	-0.322	-0.036	-0.014	-0.041	0.005	-0.001	-0.001	-0.037	-0.006	-0.043	.
non-metropolitan areas, AZ	942,343	-0.159	-0.135	0.033	0.025	-0.041	0.002	0.001	0.001	-0.038	-0.005	-0.043	.
non-metropolitan areas, FL	1,222,532	-0.173	-0.215	0.014	-0.006	-0.045	0.003	0.001	0.001	-0.041	-0.002	-0.043	.
non-metropolitan areas, ID	863,855	-0.177	-0.252	0.004	0.003	-0.046	0.004	0.000	0.000	-0.042	-0.002	-0.044	.
Myrtle Beach, SC MSA	196,629	-0.168	-0.121	0.043	0.009	-0.044	0.002	0.002	0.002	-0.040	-0.004	-0.044	221
non-metropolitan areas, TN	2,123,330	-0.181	-0.393	-0.044	0.004	-0.047	0.006	-0.002	-0.002	-0.043	-0.002	-0.044	.
non-metropolitan areas, IA	1,863,270	-0.183	-0.374	-0.036	0.011	-0.048	0.006	-0.001	-0.001	-0.043	-0.001	-0.044	.
non-metropolitan areas, ME	1,033,664	-0.185	-0.226	0.018	-0.004	-0.048	0.004	0.001	0.001	-0.044	-0.001	-0.045	.
non-metropolitan areas, MN	1,565,030	-0.157	-0.364	-0.053	0.013	-0.041	0.006	-0.002	-0.002	-0.037	-0.008	-0.045	.
Anniston, AL MSA	112,249	-0.181	-0.427	-0.057	0.000	-0.047	0.007	-0.002	-0.002	-0.042	-0.002	-0.045	222
Dothan, AL MSA	137,916	-0.180	-0.380	-0.041	-0.003	-0.047	0.006	-0.002	-0.002	-0.042	-0.002	-0.045	223
Jamestown, NY MSA	139,750	-0.143	-0.394	-0.075	0.009	-0.037	0.006	-0.003	-0.003	-0.034	-0.011	-0.045	224
non-metropolitan areas, WY	493,849	-0.193	-0.270	0.008	0.026	-0.050	0.004	0.000	0.000	-0.046	0.000	-0.046	.
Sumter, SC MSA	104,646	-0.177	-0.350	-0.033	-0.002	-0.046	0.005	-0.001	-0.001	-0.042	-0.004	-0.046	225
Columbia, MO MSA	135,454	-0.182	-0.199	0.024	0.001	-0.047	0.003	0.001	0.001	-0.043	-0.003	-0.046	226
Springfield, MO MSA	325,721	-0.185	-0.276	-0.002	-0.008	-0.048	0.004	0.000	0.000	-0.044	-0.003	-0.047	227

TABLE A1: LIST OF METROPOLITAN AND NON-METROPOLITAN AREAS BY TOTAL TAX DIFFERENTIAL, 2000

| Full Name of Metropolitan Area | Pop Size | Adjusted Differentials | | | | Federal Tax Differential | | | | State Tax Differential | Total Tax Differential | Total Tax Rank |
| | | Wage | Hous Cost | QOL | Fed Spend | Wage Effect | Deduction Effects | | Total Federal | | | |
							Partial Index	QOL Income				
non-metropolitan areas, TX	4,030,376	-0.186	-0.406	-0.048	0.009	-0.048	0.006	-0.002	-0.044	-0.003	-0.047	.
non-metropolitan areas, MS	1,869,256	-0.196	-0.496	-0.072	0.010	-0.051	0.008	-0.003	-0.046	-0.002	-0.047	.
Johnstown, PA MSA	232,621	-0.181	-0.470	-0.076	-0.003	-0.047	0.007	-0.003	-0.042	-0.006	-0.048	228
Grand Junction, CO MSA	116,255	-0.180	-0.057	0.071	-0.010	-0.047	0.001	0.003	-0.043	-0.005	-0.049	229
Goldsboro, NC MSA	113,329	-0.182	-0.286	-0.009	0.020	-0.047	0.004	0.000	-0.043	-0.005	-0.049	230
Fort Walton Beach, FL MSA	170,498	-0.202	-0.108	0.067	-0.018	-0.052	0.002	0.002	-0.048	-0.003	-0.051	231
Clarksville--Hopkinsville, TN--KY MSA	207,033	-0.206	-0.280	0.008	-0.006	-0.053	0.004	0.000	-0.049	-0.003	-0.051	232
Fayetteville, NC MSA	302,963	-0.190	-0.191	0.028	0.018	-0.049	0.003	0.001	-0.045	-0.006	-0.051	233
Las Cruces, NM MSA	174,682	-0.208	-0.240	0.023	-0.011	-0.054	0.004	0.001	-0.050	-0.003	-0.053	234
non-metropolitan areas, NM	783,050	-0.212	-0.312	0.000	0.011	-0.055	0.005	0.000	-0.050	-0.003	-0.054	.
McAllen--Edinburg--Mission, TX MSA	569,463	-0.216	-0.548	-0.082	0.006	-0.056	0.008	-0.003	-0.051	-0.004	-0.054	235
non-metropolitan areas, AR	1,607,993	-0.226	-0.437	-0.036	0.017	-0.059	0.007	-0.001	-0.053	-0.002	-0.055	.
Laredo, TX MSA	193,117	-0.220	-0.311	0.004	0.020	-0.057	0.005	0.000	-0.052	-0.004	-0.056	236
Brownsville--Harlingen--San Benito, TX MSA	335,227	-0.223	-0.469	-0.051	0.005	-0.058	0.007	-0.002	-0.053	-0.004	-0.057	237
non-metropolitan areas, KS	1,366,517	-0.227	-0.410	-0.028	0.011	-0.059	0.006	-0.001	-0.054	-0.004	-0.058	.
Wichita Falls, TX MSA	140,518	-0.226	-0.310	0.007	0.009	-0.059	0.005	0.000	-0.054	-0.004	-0.058	238
non-metropolitan areas, ND	521,239	-0.250	-0.502	-0.045	0.063	-0.065	0.008	-0.002	-0.059	-0.001	-0.059	.
Killeen--Temple, TX MSA	312,952	-0.232	-0.230	0.038	0.025	-0.060	0.004	0.001	-0.055	-0.004	-0.060	239
non-metropolitan areas, OK	1,862,951	-0.243	-0.479	-0.042	0.023	-0.063	0.007	-0.002	-0.057	-0.003	-0.060	.
Abilene, TX MSA	126,555	-0.236	-0.318	0.009	-0.014	-0.061	0.005	0.000	-0.056	-0.004	-0.061	240
non-metropolitan areas, NE	878,760	-0.254	-0.451	-0.027	0.036	-0.066	0.007	-0.001	-0.060	-0.003	-0.063	.
non-metropolitan areas, MT	774,080	-0.266	-0.240	0.057	0.015	-0.069	0.004	0.002	-0.063	0.000	-0.064	.
non-metropolitan areas, SD	629,811	-0.273	-0.435	-0.008	0.031	-0.071	0.007	0.000	-0.065	0.000	-0.065	.
non-metropolitan areas, MO	1,798,819	-0.253	-0.451	-0.030	0.005	-0.066	0.007	-0.001	-0.060	-0.006	-0.066	.
Joplin, MO MSA	157,322	-0.254	-0.418	-0.018	-0.008	-0.066	0.006	-0.001	-0.060	-0.006	-0.066	241

Populations in non-metropolitan areas are approximate.

TABLE A2: LIST OF STATES BY ESTIMATED TAX DIFFERENTIAL

| | | Adjusted Differentials | | | | Federal Tax Differential | | | | Total |
| | | | | | | Deduction Effects | | | | |
	Population	Wage	Hous Cost	QOL	Fed Spend	Wage Effect	Partial Index	QOL Income	Total Federal	Tax Rank
New Jersey	8,416,753	0.190	0.351	0.023	-0.002	0.049	-0.0054	0.0008	0.045	1
Connecticut	3,408,068	0.154	0.244	0.004	-0.006	0.040	-0.004	0.000	0.036	2
California	33,884,660	0.133	0.435	0.083	0.001	0.035	-0.007	0.003	0.031	3
District of Columbia	571,753	0.130	0.165	-0.011	0.006	0.034	-0.003	0.000	0.031	.
Maryland	5,299,635	0.111	0.129	-0.014	0.008	0.029	-0.002	-0.001	0.026	4
Massachusetts	6,353,449	0.103	0.277	0.043	-0.001	0.027	-0.004	0.002	0.024	5
New York	18,976,061	0.094	0.166	0.009	0.000	0.024	-0.003	0.000	0.022	6
Nevada	2,000,306	0.064	0.079	-0.007	0.003	0.017	-0.001	0.000	0.015	7
Alaska	626,187	0.051	0.128	0.018	0.044	0.013	-0.002	0.001	0.012	8
Delaware	783,216	0.049	-0.002	-0.027	0.002	0.013	0.000	-0.001	0.012	9
Illinois	12,417,190	0.045	0.013	-0.020	0.002	0.012	0.000	-0.001	0.011	10
Michigan	9,935,711	0.034	-0.080	-0.047	-0.006	0.009	0.001	-0.002	0.008	11
Washington	5,894,780	0.030	0.166	0.043	-0.002	0.008	-0.003	0.002	0.007	12
Rhode island	1,048,463	0.022	0.049	0.005	0.001	0.006	-0.001	0.000	0.005	13
New Hampshire	1,234,816	-0.001	0.062	0.023	0.002	0.000	-0.001	0.001	0.000	14
Colorado	4,300,832	-0.011	0.157	0.062	-0.008	-0.003	-0.002	0.002	-0.003	15
Georgia	8,186,187	-0.015	-0.125	-0.036	-0.008	-0.004	0.002	-0.001	-0.003	16
Virginia	7,080,588	-0.015	-0.051	-0.010	-0.005	-0.004	0.001	0.000	-0.004	17
Hawaii	1,211,717	-0.013	0.431	0.160	0.010	-0.003	-0.007	0.006	-0.004	18
Ohio	11,353,531	-0.023	-0.148	-0.040	-0.006	-0.006	0.002	-0.001	-0.005	19
Minnesota	4,912,048	-0.026	-0.147	-0.038	-0.004	-0.007	0.002	-0.001	-0.006	20
Pennsylvania	12,275,624	-0.027	-0.161	-0.043	0.001	-0.007	0.003	-0.002	-0.006	21
Arizona	5,133,711	-0.030	0.036	0.029	0.002	-0.008	-0.001	0.001	-0.007	22
Texas	20,848,171	-0.034	-0.155	-0.037	-0.001	-0.009	0.002	-0.001	-0.008	23
Indiana	6,081,521	-0.039	-0.185	-0.045	-0.002	-0.010	0.003	-0.002	-0.009	24
Oregon	3,424,928	-0.043	0.089	0.055	-0.001	-0.011	-0.001	0.002	-0.011	25
Wisconsin	5,357,182	-0.056	-0.133	-0.017	-0.003	-0.015	0.002	-0.001	-0.013	26
Utah	2,230,835	-0.063	-0.047	0.017	0.002	-0.016	0.001	0.001	-0.015	27
Florida	15,986,890	-0.064	-0.019	0.028	-0.005	-0.017	0.000	0.001	-0.015	28
North Carolina	8,047,735	-0.071	-0.115	-0.003	0.006	-0.019	0.002	0.000	-0.017	29
South Carolina	4,013,644	-0.096	-0.177	-0.011	-0.001	-0.025	0.003	0.000	-0.023	30
Tennessee	5,688,335	-0.100	-0.231	-0.028	0.001	-0.026	0.004	-0.001	-0.024	31
Louisiana	4,469,586	-0.103	-0.251	-0.034	-0.001	-0.027	0.004	-0.001	-0.024	32
Kentucky	4,040,856	-0.111	-0.321	-0.055	-0.004	-0.029	0.005	-0.002	-0.026	33
Alabama	4,446,543	-0.111	-0.309	-0.050	0.002	-0.029	0.005	-0.002	-0.026	34
Missouri	5,595,490	-0.111	-0.245	-0.028	0.001	-0.029	0.004	-0.001	-0.026	35
Kansas	2,687,110	-0.139	-0.301	-0.032	0.007	-0.036	0.005	-0.001	-0.033	36
New Mexico	1,818,615	-0.143	-0.119	0.034	0.014	-0.037	0.002	0.001	-0.034	37
Iowa	2,923,345	-0.147	-0.300	-0.027	0.009	-0.038	0.005	-0.001	-0.035	38
Idaho	1,294,016	-0.148	-0.209	0.005	0.004	-0.038	0.003	0.000	-0.035	39
Mississippi	2,844,004	-0.164	-0.403	-0.055	0.006	-0.043	0.006	-0.002	-0.038	40
Vermont	608,387	-0.166	-0.068	0.065	-0.002	-0.043	0.001	0.002	-0.040	41
Maine	1,275,357	-0.170	-0.188	0.024	-0.005	-0.044	0.003	0.001	-0.040	42
West Virginia	1,809,034	-0.172	-0.444	-0.065	0.014	-0.045	0.007	-0.002	-0.040	43
Arkansas	2,672,286	-0.185	-0.346	-0.023	0.011	-0.048	0.005	-0.001	-0.044	44
Oklahoma	3,450,058	-0.187	-0.365	-0.029	0.011	-0.049	0.006	-0.001	-0.044	45
Nebraska	1,709,804	-0.188	-0.329	-0.016	0.024	-0.049	0.005	-0.001	-0.044	46
Wyoming	493,849	-0.193	-0.270	0.008	0.026	-0.050	0.004	0.000	-0.046	47
North Dakota	642,412	-0.234	-0.464	-0.039	0.054	-0.061	0.007	-0.001	-0.055	48
South Dakota	753,887	-0.254	-0.402	-0.006	0.024	-0.066	0.006	0.000	-0.060	49
Montana	902,740	-0.255	-0.242	0.051	0.012	-0.066	0.004	0.002	-0.061	50