Appendix to "The Altruistic Rich? Inequality and Other-Regarding Preferences for Redistribution"

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A. Proofs

Proof of Lemma 1

We show that $\Omega_s = u\left[\bar{c}_s(1-Q_s)\right] = u(c_{e,s})$, where

$$\bar{c}_s(1-Q_s) \tag{A.1}$$

is the abbreviated social welfare function. This equivalence, well known in the welfare economics literature, is reproduced here for the convenience of the reader. For further discussion, see Atkinson (1970) and Lambert (1989: 109-136).

To begin, let $c_{e,s} = (1-\tau)y_{e,s} + T$ be the level of disposable income that represents the average utility given by the social welfare function, or

$$\frac{1}{n_s}\sum_{i=1}^{n_s} u(c_{i,s}) = \frac{1}{n_s} n_s u(c_{e,s}) = u(c_{e,s}). \tag{A.2}$$

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By Jensen's Inequality, we know that $c_{e,s} \in (0, \bar{c}_s)$ and therefore that $y_{e,s} \in (0, \bar{y})$ (provided, in our case, that local and national populations are identical). In fact, Atkinson (1970) characterizes this level of income as "equally distributed equivalent income," and it is the basic building block of the Atkinson index. It represents the level of income that if held by every individual would give that society the same level of welfare as would obtain with any given allocation of unequally distributed incomes. The Atkinson index is constructed as:

$$Q_s = 1 - \frac{c_{e,s}}{\bar{c}_s}. \tag{A.3}$$

Since $c_{e,s}$ is strictly below mean income, this expression is always positive and always between 0 and 1. Indeed, as inequality increases, social welfare decreases as does $c_{e,s}$. This will be a useful property for subsequent proofs.

Next, using the specific utility function in equation (6), we can rewrite equation (A.2) as:

$$\frac{c_{e,s}^{1-\epsilon}}{1-\epsilon} = \frac{1}{n_s} \sum_{i=1}^{n_s} \frac{c_{i,s}^{1-\epsilon}}{1-\epsilon}. \tag{A.4}$$

Rearranging this equation in terms of $c_{e,s}$, we obtain:

$$c_{e,s} = \left(\frac{1}{n_s} \sum_{i=1}^{n_s} c_{i,s}^{1-\epsilon} \right)^{1/(1-\epsilon)}. \tag{A.5}$$

Then, substituting this expression into the preliminary Atkinson index in equation (A.3), we obtain:

$$Q_s = 1 - \frac{1}{\bar{c}_s} \left(\frac{1}{n_s} \sum_{i=1}^{n_s} c_{i,s}^{1-\epsilon} \right)^{1/(1-\epsilon)}, \tag{A.6}$$

which is equivalent to the expression given in equation (8).

Finally, to recover the social welfare function, substitute the Atkinson index in (A.6) into the abbreviated social welfare function (A.1) and then substitute the result into the utility-function specification in equation (6). The result is Ω_s. Hence, we have $\Omega_s = u\left[\bar{c}_s(1-Q_s)\right] = u(c_{e,s})$.

□

Proof of Proposition 1

First, we prove Part (A). The individual's problem is to choose the tax rate that maximizes her social utility function, given by equation (4):

$$\max_{\tau \in [0,1]} V = (1-\delta)u(c_i) + \delta u(c_{e,s}) \tag{A.7}$$

subject to the government budget constraint in equation (2) and the individual's own budget constraint in equation (3). The first-order condition for this problem gives the preferred level of redistribution for each individual i, which we will term τ_i^*:

$$(1-\delta)u'(c_i)\big[(1-\tau_i^*)\bar{y} - y_i\big] + \delta u'(c_{e,s})\big[(1-\tau_i^*)\bar{y} - y_{e,s}\big] = 0. \tag{A.8}$$

The second-order condition is given by:

$$\begin{aligned} \frac{\partial^2 V}{\partial \tau^2} \equiv \sigma(\tau_i^*, y_i, y_{e,s}) = (1-\delta)\left\{u''(c_i)[(1-\tau)\bar{y} - y_i]^2 - u'(c_i)\bar{y}\right\} \\ + \delta\left\{u''(c_{e,s})\big[(1-\tau)\bar{y} - y_{e,s}\big]^2 - u'(c_{e,s})\bar{y}\right\} < 0, \end{aligned} \tag{A.9}$$

which is unambiguously negative.

Next, we show that $\tau_i^* \in [0,1)$. We reformulate the first-order condition in equation (A.8), writing the differences $(1-\tau_i^*)\bar{y} - y_i$ and $(1-\tau_i^*)\bar{y} - y_{e,s}$ in terms of ratios as:

$$\tau_i^* = \left(1 - \frac{y_i}{\bar{y}}\right) + \frac{\delta}{1-\delta}\left(\frac{c_i}{c_{e,s}}\right)^{\epsilon}\left[(1-\tau_i^*) - \frac{y_{e,s}}{\bar{y}}\right]. \tag{A.10}$$

Expressing the first-order condition in terms or ratios rather than differences constitutes no substantive change for our following results; it is simply done for analytical convenience. If $\delta = 0$, that is, if individuals are not altruistic, then individual i's optimal choice of redistribution is $\tau_i^* = 1 - y_i/\bar{y}$, which is a familiar result for self-interested preferences. In this case, preferences for redistribution are clearly decreasing in income, with τ_i^* going from 1 to 0 as income goes from 0 to $\bar{y}$. Compare this to altruistic individuals, $\delta > 0$. Setting $\tau = 0$, equation (A.10) can be rewritten as:

$$\frac{\delta}{1-\delta}\left(\frac{y_i}{y_{e,s}}\right)^{\epsilon} = -\frac{(\bar{y} - y_i)}{\big(\bar{y} - y_{e,s}\big)}. \tag{A.11}$$

Since the left-hand side is positive, this condition requires $y_i > \bar{y}$. Define the value of y_i that satisfies this equation as $\hat{y}$. Hence, $\hat{y} > \bar{y}$, as claimed. Notice also that $\hat{y}$ is potentially quite large, especially as inequality increases: $y_{e,s} \to 0$. Finally, the maximum level of redistribution preferred by any individual is always less than one. Setting $\tau = 1$ in equation (A.10), we get

$$\frac{\delta}{1-\delta} = -\left(\frac{y_i}{y_{e,s}}\right), \tag{A.12}$$

which is never satisfied.

Further exploration of equation (A.10) provides some additional important insights. First, let τ_e^* be the level of redistribution that maximizes social welfare, $\Omega_s = u(c_{e,s})$. The value of τ_e^* is such that the first-order condition for maximizing social welfare equals zero, which is $(1-\tau_e^*) = y_{e,s}/\bar{y}$. Evaluated at τ_e^*, the second expression on the right-hand side of equation (A.10) becomes zero, so equation (A.10) becomes $\tau_e^* = 1 - y_i/\bar{y}$. Clearly, the level of individual income that satisfies this expression is $y_{e,s}$. Hence, an individual with income $y_i = y_{e,s}$ prefers the level of redistribution that maximizes social welfare. Furthermore, along with Part (B) below, this also implies that for $y_i > y_{e,s}$, we have $\tau_i^* < \tau_e^*$ and thus $(1-\tau_i^*) - y_{e,s}/\bar{y} > 0$. That is, for $y_i > y_{e,s}$, an individual prefers a level of taxes and transfers such that the marginal benefit of reducing inequality exceeds its cost. In other words, individuals with income above the equally distributed equivalent prefer less redistribution than social welfare demands, and hence social welfare is positive and increasing at this level of redistribution.

However, this also means that for $y_i > y_{e,s}$, an individual prefers more redistribution than if she were purely self-interested. To see this, evaluate equation (A.10) for a self-interested individual (i.e., $\delta = 0$) with income $y_i > y_{e,s}$. This implies that $(1-\tau_i^*) - y_i/\bar{y} = 0$. Compared to an altruistic individual ($\delta > 0$), this makes the second term on the right-hand side of (A.10) positive, because social welfare is increasing for $\tau_i^* < \tau_e^*$, which implies that $\tau_i^*(y_i > y_{e,s}, \delta > 0) > \tau_i^*(y_i > y_{e,s}, \delta = 0)$. Because this is true, this also implies that for an altruistic individual we have $(1-\tau_i^*) - y_i/\bar{y} < 0$. That is, the marginal benefit of redistribution to an individual's material self-interest is lower than its cost. In other words, relatively well-off individuals sacrifice some material self-interest in order to satisfy their altruistic preferences for reducing inequality. An analogous argument holds for $y_i < y_{e,s}$. However, these cases require choosing more redistribution than social welfare requires, $(1-\tau_i^*)-y_{e,s}/\bar{y} < 0$. Further, this means that the second term on the right-hand side of equation (A.10) is now *negative*, which implies that an individual with $y_i < y_{e,s}$ prefers *less* redistribution than self-interest demands: $(1-\tau_i^*)-y_i/\bar{y} > 0$.

To summarize, individuals with income below the equally distributed equivalent ($y_i < y_{e,s}$) want less redistribution than they would if they were purely self-interested, but more redistribution than is socially optimal. In contrast, individuals with income above the equally distributed equivalent ($y_i > y_{e,s}$), prefer more redistribution than if they were purely self-interested but less than is socially optimal.

Second, we prove Part (B), which states that an individual i's preferred level of redistribution τ_i^* is decreasing in individual income y_i. Formally, we seek to demonstrate that $\frac{\partial \tau_i^*}{\partial y_i} < 0$. Totally differentiating the first-order condition in equation (A.8), we obtain

$$\frac{d\tau_i^*}{dy_i} = -\frac{(1-\delta)\{u''(c_i)[(1-\tau)\bar{y}-y_i](1-\tau)-u'(c_i)\}}{\sigma(\tau_i^*, y_i, y_{e,s})}. \tag{A.13}$$

Since the expression in the denominator is negative, the sign of the derivative depends on the sign of the numerator. For $(1-\tau)\bar{y} \geq y_i$, the numerator is clearly negative. For $(1-\tau)\bar{y} < y_i$, the numerator is negative if the following condition holds: $u''(c_i)[(1-\tau)\bar{y}-y_i](1-\tau)-u'(c_i) < 0$. This condition reduces to $(1-\epsilon)y_i + \epsilon(1-\tau)\bar{y} + T/(1-\tau) > 0$, which is true for all $\epsilon \in (0,1)$, all $y_i \in [0,\infty)$, and all $\tau \in [0,1]$. Hence, we have $\frac{\partial \tau_i^*}{\partial y_i} < 0$. This proves Part (B).

Third, we prove Part (C). Part (C) states that an individual i's preferred level of redistribution τ_i^* is increasing in inequality Q_s. Formally, we demonstrate that $\frac{\partial \tau_i^*}{\partial Q_s} > 0$. From Lemma 1, we can express a change in inequality as an increase in Q_s: $y_{e,s} = Q_0 - Q_s$. Totally differentiating the first-order condition in equation (A.8), we obtain

$$\frac{d\tau_i^*}{dQ_s} = -\frac{\delta\left\{-u''(c_{e,s})\left[(1-\tau)\bar{y}-y_{e,s}\right](1-\tau)+u'(c_{e,s})\right\}}{\sigma(\tau_i^*, y_i, y_{e,s})}. \tag{A.14}$$

Once again, since the expression in the denominator is negative, the sign of the derivative depends on the sign of the numerator. The numerator is clearly positive for $(1-\tau)\bar{y} \geq y_{e,s}$. For $(1-\tau)\bar{y} \leq y_{e,s}$, the expression in the numerator is positive if the following condition holds: $-u''(c_{e,s})\big[(1-\tau)\bar{y}-y_{e,s}\big](1-\tau)+u'(c_{e,s})>0$. This condition reduces to $(1-\epsilon)y_{e,s}+\epsilon(1-\tau)\bar{y}+T/(1-\tau)>0$, which is true for all $\epsilon\in(0,1)$, all $y_{e,s}\in[0,\bar{y}]$, and all $\tau\in[0,1]$. Hence, we have $\frac{\partial\tau_i^*}{\partial Q_s}>0$.

Fourth, we prove Part (D). Part (D) states that the effect of an increase in inequality Q_s on an individual i's preferred level of redistribution τ_i^* is increasing in individual income y_i. Formally, this is equivalent to $\frac{\partial^2\tau_i^*}{\partial Q_s\partial y_i}\geq 0$. Furthermore, this will be true if and only if $\epsilon>0$, otherwise $\frac{\partial^2\tau_i^*}{\partial Q_s\partial y_i}=0$. We demonstrate this second claim first. Using the version of the first-order condition in equation (A.10), set $\epsilon=0$. We can then rewrite (A.10) as:

$$\tau_i^*=(1-\delta)\left(1-\frac{y_i}{\bar{y}}\right)+\delta\left(1-\frac{y_{e,s}}{\bar{y}}\right). \tag{A.15}$$

It is immediate from this that $\frac{\partial\tau_i^*}{\partial Q_s}=\frac{\delta}{\bar{y}}$ and therefore that $\frac{\partial^2\tau_i^*}{\partial Q_s\partial y_i}=0$. This proves that $\epsilon\neq 0$ is a necessary condition for $\frac{\partial^2\tau_i^*}{\partial Q_s\partial y_i}>0$. Establishing the rest of the proof will demonstrate sufficiency.

We begin by showing that $\frac{\partial^2\tau_i^*}{\partial Q_s\partial y_i}>0$ for all $y_i\in[0,y_{e,s})$. By factoring out $\delta c_e^{-\epsilon}$ from the numerator and denominator, rewrite the expression for $\partial\tau_i^*/\partial Q_s$ from equation (A.14) as:

$$\frac{d\tau_i^*}{dQ_s}=\frac{A}{MB+C}, \tag{A.16}$$

where

$$A=\frac{\epsilon[(1-\tau)\bar{y}-y_{e,s}](1-\tau)}{c_{e,s}}+1>0,$$

$$M=\left(\frac{1-\delta}{\delta}\right)\left(\frac{c_{e,s}}{c_i}\right)^{\epsilon}>0,$$

$$B=\frac{\epsilon[(1-\tau)\bar{y}-y_i]^2}{c_i}+\bar{y}>0,$$

and

$$C=\frac{\epsilon[(1-\tau)\bar{y}-y_{e,s}]^2}{c_{e,s}}+\bar{y}>0.$$

We need to show that the following is true:

$$\frac{\partial^2\tau_i^*}{\partial Q_s\partial y_i}=\frac{\frac{\partial A}{\partial y_i}(MB+C)-A\left(\frac{\partial M}{\partial y_i}B+M\frac{\partial B}{\partial y_i}+\frac{\partial C}{\partial y_i}\right)}{(MB+C)^2}>0. \tag{A.17}$$

Differentiating A with respect to y_i, we obtain:

$$\frac{\partial A}{\partial y_i} = -\left(\frac{\epsilon[(1-\tau)\bar{y} - y_{e,s}] + \epsilon(1-\tau)\bar{y}}{c_{e,s}} + \frac{\epsilon(1-\tau)[(1-\tau)\bar{y} - y_{e,s}]^2}{c_{e,s}^2}\right)\frac{\partial \tau_i^*}{\partial y_i}. \tag{A.18}$$

For $y_i < y_{e,s}$, we have $[(1-\tau)\bar{y} - y_{e,s}] < 0$, which makes the first term within the parentheses ambiguous and the second term positive. However, since $y_i < y_{e,s}$ makes the first term in A negative and $[(1-\tau)\bar{y} - y_{e,s}] \to 0$ as $y_i \to y_{e,s}$, the expression must be positive (since $-\partial \tau_i^*/\partial y_i > 0$). This implies $\frac{\partial A}{\partial y_i}(MB + C) > 0$. Next, we have:

$$\frac{\partial M}{\partial y_i} = \epsilon\left(\frac{1-\delta}{\delta}\right)\left(\frac{c_{e,s}}{c_i}\right)^{\epsilon} \times \left[\left(\frac{[(1-\tau_i^*)\bar{y} - y_{e,s}]}{c_{e,s}} - \frac{[(1-\tau_i^*)\bar{y} - y_i]}{c_i}\right)\frac{\partial \tau_i^*}{\partial y_i} - \frac{(1-\tau_i^*)}{c_i}\right]. \tag{A.19}$$

For $y_i < y_{e,s}$, we have $[(1-\tau_i^*)\bar{y} - y_i] > 0$ and $[(1-\tau_i^*)\bar{y} - y_{e,s}] < 0$. This makes the parenthetical term within brackets positive. However, because the gross income effect dominates the redistribution effect, the negative term, $-(1-\tau_i^*)/c_i$, dominates the positive term within parentheses. This makes the whole expression negative and therefore, $-A\frac{\partial M}{\partial y_i}B > 0$.

Next, we have:

$$\frac{\partial B}{\partial y_i} = -\frac{2\epsilon[(1-\tau)\bar{y} - y_i]}{c_i} - \frac{\epsilon[(1-\tau)\bar{y} - y_i]^2(1-\tau)}{c_i} - \left(\frac{2\epsilon[(1-\tau)\bar{y} - y_i]\bar{y}}{c_i} + \frac{\epsilon[(1-\tau)\bar{y} - y_i]^3}{c_i^2}\right)\frac{\partial \tau_i^*}{\partial y_i}. \tag{A.20}$$

Once again, we have $[(1-\tau)\bar{y} - y_i] > 0$, which makes the first two terms negative, but the second two terms positive, since $-\partial \tau_i^*/\partial y_i > 0$. However, since in B $[(1-\tau)\bar{y} - y_i]^2 > 0$ and $[(1-\tau)\bar{y} - y_i] \to 0$, the first negative "income" effect must dominate the second, positive "tax" effect. Therefore, $-AM\frac{\partial B}{\partial y_i} > 0$.

Finally, we have

$$\frac{\partial C}{\partial y_i} = -\left(\frac{2\epsilon[(1-\tau)\bar{y} - y_{e,s}]\bar{y}}{c_{e,s}} + \frac{\epsilon[(1-\tau)\bar{y} - y_{e,s}]^3}{c_e^2}\right)\frac{\partial \tau_i^*}{\partial y_i}. \tag{A.21}$$

which, since $[(1-\tau)\bar{y}-y_{e,s}]<0$ for $y_i < y_{e,s}$ must be negative. Therefore, $-A\frac{\partial C}{\partial y_i} > 0$ and we conclude that equation (A.17) is positive.

Observe that for $y_i = y_{e,s}$, $[(1-\tau)\bar{y}-y_{e,s}]=0$ and $[(1-\tau)\bar{y}-y_i]=0$. Using this fact, we get $d\tau_i^*/dQ_s = \delta/\bar{y}$. Hence at $y_i = y_{e,s}$, $\frac{\partial^2 \tau_i^*}{\partial Q_s \partial y_i} = 0$.

For $y_i \in (y_{e,s}, \hat{y}]$, it is easiest to show that $\frac{\partial^2 \tau_i^*}{\partial Q_s \partial y_i} > 0$ by making an analogous argument using the expression for $\partial \tau_i^*/\partial y_i$ given in equation (A.13). In that case, we show that $\frac{\partial^2 \tau_i^*}{\partial y_i \partial Q_s} > 0$. Since $\frac{\partial^2 \tau_i^*}{\partial y_i \partial Q_s}$ and $\frac{\partial^2 \tau_i^*}{\partial Q_s \partial y_i}$ are equivalent, this proves that $\frac{\partial^2 \tau_i^*}{\partial Q_s \partial y_i} \geq 0$ for all $y_i \in [0,\infty)$ and this concludes the proof.

$\square$

B. Alternative Models of Preferences

Inequity Aversion

Using the form of inequity aversion proposed by Fehr and Schmidt (1999), other-regarding preferences takes the form:

$$\Omega^I = -\alpha \frac{1}{n-1} \sum_{j \neq i} \max\{c_j - c_i, 0\} - \beta \frac{1}{n-1} \sum_{j \neq i} \max\{c_i - c_j, 0\}. \tag{B.1}$$

Note that, according to Fehr and Schmidt, inequity aversion is a function of individuals' *monetary payoffs* rather than their utilities (ibid., p. 822). We make the same assumption in order to distinguish the implications of their argument form ours.

In Fehr and Schmidt's conception, an individual evaluates inequality differently depending on her income relative to others. Inequality of incomes that is greater than the income of a given individual i is termed "disadvantageous inequality" or envy. Envy is captured by the first term in (B.1) and weighted by α. Meanwhile, inequality of incomes that is below an individual i is called "advantageous inequality" or altruism. Altruism is captured by the second term in (B.1) and weighted by β. The critical restriction that Fehr in Schmidt place on their version of other-regarding preferences is that $\beta \leq \alpha$ and $0 \leq \beta < 1$, which implies that concern about advantageous inequality is weighted less than concern about disadvantageous inequality. Alternatively, one could say that individuals are more envious than they are altruistic. This assumption has important implications for redistributive preferences, which we will soon see.

The following proposition states how inequity aversion influences preferences for redistribution and in particular how a change in inequality changes those preferences.

Proposition 1. *Under inequity-aversion preferences, the preferred tax rate, τ_i^* is decreasing in income y_i and increasing in inequality. Furthermore, for any two individuals i and j with gross incomes $y_i < y_j$, a mean-preserving increase in income inequality either does not change, increases by the same amount, or increases i's demand for redistribution more than j's.*

Proof.

For this problem, each individual chooses a tax rate to maximize her utility specified by equation (4) with Ω given by equation (B.1), subject to her budget constraint in equation (3) and the government's budget constraint in equation (2). Recall that for Fehr and Schmidt, individuals have linear (non-concave) utility functions, so $u(c_i) = c_i$. The first-order condition for this problem gives:

$$(1-\tau)\bar{y} - y_i + \Omega^I_\tau = 0. \tag{B.2}$$

Rearranging terms, we can solve for an individual i's preferred level of redistribution:

$$\tau^I_i = 1 - \frac{y_i}{\bar{y}} + \frac{1}{\bar{y}}\left(\alpha \frac{1}{n-1}\sum_{j\neq i}\max\{y_j - y_i, 0\} + \beta\frac{1}{n-1}\sum_{j\neq i}\max\{y_i - y_j, 0\}\right). \tag{B.3}$$

Since the expression within parentheses is strictly positive for all y_i, inequity-aversion preferences increase the income threshold for a positive level of preferred redistribution.

Next, we show that the preferred level of redistribution is decreasing in income. First, define the following convenient terms for disadvantageous and advantageous gross income inequality respectively, Y_i^- and Y_i^+:

$$Y_i^- = \frac{1}{n-1}\sum_{j\neq i}\max\{y_j - y_i, 0\}, \tag{B.4}$$

$$Y_i^+ = \frac{1}{n-1}\sum_{j\neq i}\max\{y_i - y_j, 0\}. \tag{B.5}$$

Accordingly, observe that Y_i^- decreases as y_i increases and that Y_i^+ increases as y_i increases. Also note that $Y_N^- = 0$ and $Y_1^+ = 0$. Further note that $Y_1^- > Y_N^+$. Then, taking the difference between the preferred policies of i and n we obtain:

$$\tau_i - \tau_N = \frac{1}{\bar{y}}\left[y_N - y_i + \alpha Y_i^- - \beta(Y_N^+ - Y_i^+)\right]. \tag{B.6}$$

Then, since $\beta \leq \alpha$, and $y_N - y_i > 0$ and $Y_i^- > Y_N^+ - Y_i^+$ for all $i \in \{1, 2, \ldots, n\}$, this expression will be positive for all $i < n$. Furthermore, since $y_N - y_i$, Y_i^-, and $Y_N^+ - Y_i^+$ are all decreasing in y_i, the difference $\tau_i - \tau_N$ is decreasing in y_i, Thus, the poor prefer more redistribution than the rich and an individual's preferred level of redistribution is decreasing in her income.

Finally, we show that an increase in inequality will increase the demand for redistribution more for the poor than for the rich. Consider an increase in inequality between two individuals k and l with gross incomes $y_k < y_l$ such that for a change in income Δ the result is $y_k - \Delta$ and $y_l + \Delta$. Then for any two individuals i and j with incomes $y_i < y_j$, three consequences are possible. First, if $y_j > y_i > y_l + \Delta$ or $y_k - \Delta > y_j > y_i$ or $y_j > y_l + \Delta > y_k - \Delta > y_i$ then the redistribution preferences of both i and j do not change, since neither is disadvantaged by the increase in inequality. Second, if $y_l + \Delta > y_j > y_i > y_k - \Delta$, then both are disadvantaged by the increase in inequality and both increase their demand for redistribution by the same amount. The third case is where $y_j > y_l + \Delta > y_i > y_k - \Delta$. In this case, i is disadvantaged by the increase in inequality while j is not. Thus, the preferred level of redistribution will increase for the poorer individual but not for the richer individual.

□

Fairness

A third specification of other-regarding preferences is proposed by Alesina and Angeletos (2005), which we call "fairness" preferences. We call these fairness preferences because the basic idea is that individuals have both "earned" or "fair" income as well as "unearned" or "unfair" income, and that only "unfair" income comes at a utility cost to individuals. Thus, inequality of final outcomes is not of concern to individuals, and individuals may tolerate a high degree of inequality, provided that it is "fair." In this model, fair income is denoted $\hat{y}_i$ and is equal to y_i in our previous models. Likewise, unfair income, obtained through lucky or illicit transactions, is denoted η_i. Unearned income η_i is assumed to have zero mean and to be independently distributed from $\hat{y}_i$. Total gross income is then defined as:

$$y_i = \hat{y}_i + \eta_i \tag{B.7}$$

and we can note that $\eta_i = y_i - \hat{y}_i$.

With fairness preferences, other-regarding utility takes the form

$$\Omega^F = -\gamma \frac{1}{N} \sum_{i=1}^{N} (c_i - \hat{c}_i)^2, \tag{B.8}$$

where, with y_i suitably redefined by equation (B.7), disposable income c_i is given by equation (3) and $\hat{c}_i = \hat{y}_i$ is "fair" disposable income. Note that, in agreement with Alesina and Angeletos, and to make clear the distinctive implications of their argument, we assume that individuals' have linear (non-concave) utility functions and therefore that their utility is equivalent to their monetary consumption. Given the independence of η_i and $\hat{y}_i$, other-regarding utility in equation (B.8) can be rewritten as:

$$\begin{aligned}\Omega^F &= -\gamma\left[\tau^2\frac{1}{N}\sum_{i=1}^{N}\left(\hat{y}_i+\frac{1}{2}\tau-\bar{y}\right)^2+(1-\tau)^2\frac{1}{N}\sum_{i=1}^{N}\left(y_i-\hat{y}_i\right)^2\right]\\ &= -\gamma\left[\tau^2\text{Var}(\hat{y}_i)+(1-\tau)^2\text{Var}(y_i-\hat{y}_i)+\frac{1}{2}\tau^4\right].\end{aligned} \tag{B.9}$$

Thus, other-regarding utility can be decomposed into the variances of fair and unfair gross income, weighted by the tax-and-transfer policy level. The following proposition states the implications we obtain from the fairness model of other-regarding utility.

Proposition 2. *Under fairness preferences, the preferred tax rate, τ_i^*, is decreasing in income y_i and decreasing in inequality. Furthermore, the effect of an increase in income inequality on an individual's preferred tax rate is decreasing in an individual's income.*

Proof.

With fairness preferences, an individual chooses the tax-and-transfer policy to maximize her utility subject to the the budget constraint in equation (3), the government's budget constraint in (2), and other-regarding preferences as defined by Alesina and Angeletos (2005) in equation (B.8). Recall that in this case, own utility is equivalent to consumption. Differentiating this expression leads to the following first-order condition:

$$-y_i+\bar{y}(1-\tau)-\gamma\left[2\tau\text{Var}(\hat{y}_i)-2(1-\tau)\text{Var}(y_i-\hat{y}_i)+2\tau^3\right]=0. \tag{B.10}$$

Rearranging and simplifying the first-order condition gives us:

$$\tau_i^F = 1-\frac{y_i}{\bar{y}}-\frac{\gamma}{\bar{y}}\left[2\tau\text{Var}(\hat{y}_i)-2(1-\tau)\text{Var}(y_i-\hat{y}_i)+2\tau^3\right]. \tag{B.11}$$

Clearly, as in previous results, an individual's preferred level of redistribution is decreasing in income. Since the expression within brackets does not change across individuals and their income, y_i has the same effect on redistributive preferences as it does in the model of self-interested preferences.

Finally, it is straightforward to observe that an increase in earned-income inequality reduces an individual's preferred level of redistribution. Consider two individuals, j and k with $y_j < y_k$, and suppose that there is a change of earned income, such that inequality increases: $y_j' = y_j - \Delta$ and $y_k' = y_k + \Delta$. Differentiating the earned income variance term $\mathrm{Var}(\hat{y}_i)$ in equation (B.10) with respect to Δ gives $2(y_k - y_j) > 0$. Thus, an increase in inequality will increase the variance in earned income. Next, applying the implicit function theorem to equation (B.10), we obtain:

$$\frac{d\tau_i^F}{d\Delta} = \frac{\gamma 2\tau \partial \mathrm{Var}(\hat{y}_i)/\partial \Delta}{-\bar{y} - \gamma\left[2\mathrm{Var}(\hat{y}_i) + 2\mathrm{Var}(y_i - \hat{y}_i) + 6\tau^2\right]} < 0. \tag{B.12}$$

Since the numerator of this expression is positive while the denominator is negative, the whole expression is negative. Hence, an individual's optimal level of redistribution decreases as earned income inequality increases.

Finally, the effect of an increase in inequality on an individual's preferred tax rate is also decreasing in income. Although an individual's income y_i does not appear directly in equation (B.12), if affects it indirectly through τ. Thus, as y_i increases, the numerator of expression (B.12) goes to zero while the denominator remains strictly non-zero. Hence the negative effect given in (B.12) decreases (in absolute value) as y_i increases.

□

C. Deriving the full estimating equation

From the first order condition of individual i's utility function in (4) we derive the theoretical function $\tau_i^*(y_i, Q_s)$, which represents i's preferred level of redistribution, τ_i^*, given i's income, y_i, and the level of inequality, Q_s. The second-order Taylor expansion of $\tau_i^*(y_i, Q_s)$ is given by:

$$\tau_i^* = x + \frac{\partial \tau_i^*}{\partial y_i} y_i + \frac{\partial \tau_i^*}{\partial Q_s} Q_s + \frac{\partial^2 \tau_i^*}{\partial Q_s \partial y_i} Q_s y_i + \frac{1}{2}\frac{\partial^2 \tau_i^*}{\partial y_i^2} y_i^2 + \frac{1}{2}\frac{\partial^2 \tau_i^*}{\partial Q_s^2} Q_s^2. \tag{C.1}$$

Thus our full regression equation takes the form:

$$\tau_i^* = ax + by_i + cQ_s + dQ_s y_i + 0.5ey_i^2 + 0.5fQ_s^2. \tag{C.2}$$

Here, we measure τ_i^* by R_i, an individual's continuous (categorical) stated preference for redistribution, just as we did in Specification (4) in Table 2. Estimating equation (C.2) using nonlinear least squares (using HC2 corrected 'robust' standard errors) we confirm the result for our central prediction that $\frac{\partial^2 \tau_i^*}{\partial Q_s \partial y_i} > 0$. Numerically, the estimated marginal effect is 0.329 with a standard error of 0.077, while with the 'reduced' model used in the main text we obtained an estimate of 0.379, with s.e. 0.075.

D. Descriptive statistics

Table D.1: Descriptive statistics

Continuous variables	Mean	SD	Min	Max
Income distance [10.000$]	0.087	3.592	−5.687	12.542
Inequality (Atkinson)	0.249	0.047	0.164	0.405
Age [10 yrs]	3.980	1.168	2.000	6.500
Education [yrs]	13.354	2.855	0.000	20.000
State unemployment [%]	6.183	2.030	2.300	17.400
Indicator variables	**%**			
Female	53.9			
Black	13.4			
Other race	5.4			
Part-time employed	11.9			
Unemployed	6.3			
Self-employed	11.4			

E. Bootstrap standard errors

Table E.1: Income, inequality and redistribution preferences. Estimates with analytical standard errors in parentheses and cluster-bootstrap standard errors in brackets

	(1)	(2)	(3)	(4)
Income	−0.126	−0.105	−0.106	−0.189
	(0.016)	(0.016)	(0.016)	(0.020)
	[0.017]	[0.016]	[0.016]	[0.021]
Inequality	1.402	0.696	0.994	2.195
	(0.531)	(0.501)	(0.838)	(1.140)
	[0.599]	[0.590]	[0.840]	[1.321]
Income×inequality	0.209	0.208	0.210	0.379
	(0.058)	(0.058)	(0.059)	(0.075)
	[0.065]	[0.058]	[0.060]	[0.077]
Controls	no	yes	yes	yes
Deviance	22172	21718	21640	—
BIC	22409	22063	22448	—
N	19025	19025	19025	19025

Specifications: (1), (2): Random effects, maximum likelihood estimates, (3) Fixed effects, maximum likelihood estimates, (4) Fixed effects, linear probability model. Bootstrap standard errors based on 500 re-samples within state panels.

F. Envy

In this subsection we expand on model specifications we conducted to asses how likely it is that our results are driven by respondents' envy instead of inequity aversion. In Table F.1 we present the results of two calculations. Just like in our model in the main text, specification (1) uses the full distribution of incomes to calculate the Atkinson index of inequality. Specification (2) uses the share of income held by the top 1% of income earners, calculated from IRS tax returns following the methodology of Piketty and Saez (2003). The tables entries are average marginal effects of inequality and top 1% income shares, respectively, calculated for what we term "the Rich" (those at the 90th percentile of the income distribution).

Table F.1: Average marginal effect of inequality among the Rich using two different concepts of inequality.

	$AME(Q \mid Y = y_R, X)$	
(1) Income inequality	0.489	(0.157)
(2) Top 1% income share	0.303	(0.176)

Note: Based on specification 2.

If inequity aversion is predominantly driven by envy, we expect the average marginal effect among the rich to be noticeably larger in Specification (2) compared to Specification (1). However, contrary to this expectation, we find the effect of 1% top income shares among the rich to be reduced by 38%. While our available data does not allow us to draw a firm, "once-and-for-all" conclusion on this issue, these results do point towards income-dependent altruism being the dominant mechanism, not envy.

G. CPS income data

For confidentiality reasons, the Current Population Survey public use files employ a system of top-codes to protect the confidentiality of respondents (both those with very high and very low incomes). In CPS's March Annual Social and Economic Supplement used here, different top-codes are used for the various income components that make up individual income, and, by extension, household income. The share of individual records affected by top-coding has risen from about 1 percent in 1978 to almost 6 percent in 2007 (Larrimore et al. 2008: 96). Clearly, truncating the distribution of income affects estimates of household income and inequality (see Feng et al. 2006; Burkhauser et al. 2010 for the importance of accounting for censoring when calculating measures of inequality).

Larrimore et al. (2008) use restricted (internal) CPS data to generate average income values for cells of top-coded individuals defined by a range of social characteristics. They show that using such replacement values to impute top-coded income produces income distributions (and derived measures) very close to those produced using restricted-use CPS data. The Census Bureau publishes a similar series of replacement values based on a rank proximity swap value method.[4] We use this series to address top-coding in CPS data using the following steps. (1) We assign census replacement values for each top-coded income component of an individual. (2) We sum all income components to generate a measure of individual income adjusted for top-coding. (3) We sum the incomes of all household members to generate a measure of household income. This new measure is the basis for all our calculations using the CPS.

H. National inequality

Following the suggestion of one of our reviewers, we study if the income-conditional effect of inequality is also visible on the national level. Figure 4 in the main text shows a secular increase in inequality throughout the states. In this subsection, we substitute our state-level measures of inequality (which provided 1,078 state-year values of inequality) with 22 measured levels of inequality on the national level. We estimate a simplified linear model including the same individual level controls as in the main text. We account for the fact that respondents are nested in survey years by using clustered standard errors. Table H.1 shows average marginal effects of national inequality among the rich and the poor (defined, as before, as those at the 90th and 10th percentile of the national income distribution). Complementarily, Figure H.1 plots expected values of redistribution preferences among Rich and Poor for rising levels of inequality. Note that the national distribution of income inequality is more compressed than the state-level one (the largest observed national value is 0.328 in 2006, while it was 0.405 in Connecticut in the same year.)

Even when using more limited information (and variability) on the country-level over time, we see the basic pattern in our model. As inequality increases (all else equal) the rich tend to be more supportive of redistribution. The average marginal effect of a unit change in national income inequality on preferences for redistribution among the rich is almost 2 points. Among the poor, changing inequality is not systematically related to preferences. We also test if the difference in inequality marginal effects

[4] See www.census.gov/srd/papers/pdf/rr96-4.pdf for details on the methodology, and www.census.gov/housing/extract_files/toc/data/ for published replacement values.

Table H.1: Marginal effect of national inequality among poor and rich.

Marginal effect of inequality		
(1) among the poor	−0.838	(0.994)
(2) among the rich	1.945	(0.777)
Diff. (1)–(2)	*p*=0.001	

Note: T=22. Average marginal effects from linear regression model. Clustered standard errors Difference test is distributed F with 1df.

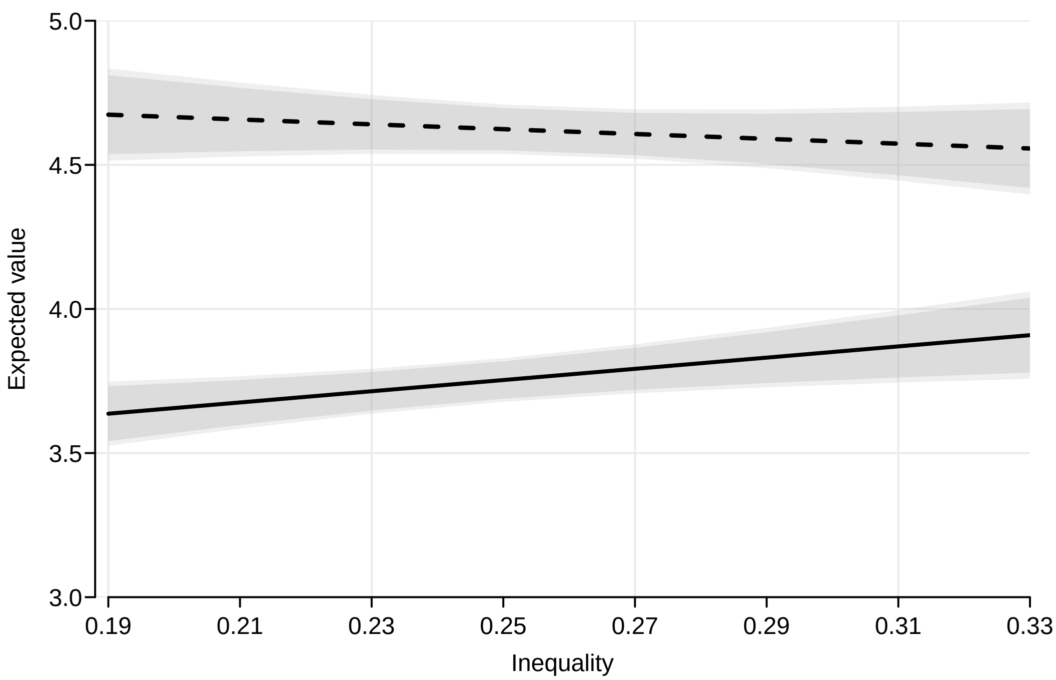

Figure H.1: Income-dependent altruism: the effect of an increase in *national* inequality on redistribution preferences among the rich (solid line) and the poor (dashed line).

between rich and poor is significantly different from zero and cannot reject the null hypothesis that they are not ($p = 0.001$).

I. Importance of national redistribution for individual states

In this section we illustrate the importance of *national* redistribution to citizens in individual states. First, we evaluate the condition outlined in proposition 1 (c), namely that equally distributed equivalent income in each state is below the national mean. We then show that, in each state-year, the distribution of incomes makes a seizable number of individuals likely beneficiaries of redistributive policies; and we show that each state does indeed receive a seizable number of *federal* transfers. First, we calculate the difference between national income and equally distributed equivalent income in each state and find that the latter is generally below (or at) the former. Second, we calculate the state-level share of individuals with incomes below the national mean (making them likely recipients of redistributive transfers). Third, we calculate how federal resources are disbursed to citizens in each state (via direct transfers and social programs).

Evaluating the condition $y_e < \bar{y}$ in each state-year To evaluate if $y_e < \bar{y}$, we need estimates of y_e by state-year and $\bar{y}$ by year. We use March CPS data (see section G) to calculate mean income in each year, and equally distributed equivalent income in each state-year. The latter is given by (cf. lemma 1):

$$\left(\frac{1}{N} \sum_{i=1}^{N} y_{i,s}^{1-\epsilon} \right)^{1/(1-\epsilon)} .$$

Our calculations account for top-coding of incomes as well as for the sampling design of the CPS. We then calculate the difference $y_e - \bar{y}$ taking into account its estimation uncertainty.[5] Figure I.1 plots the resulting differences by state and year. It shows that the data generally support our assumption: in the vast majority of states y_e is below or at the national mean, $\bar{y}$; in cases where both are close they are not statistically

[5]Uncertainty for the national mean is simply the (analytical) standard error of the mean, while we assess the uncertainty of state equally distributed equivalent income using 100 bootstrap replicates. We calculate a 95% confidence interval around the difference via Monte Carlo simulation using 1,000 draws.

distinguishable from each other. The clear exceptions are Alaska, where equivalent income is above the national mean up to 1990, and Maryland, where it is above the national mean until the mid-eighties.

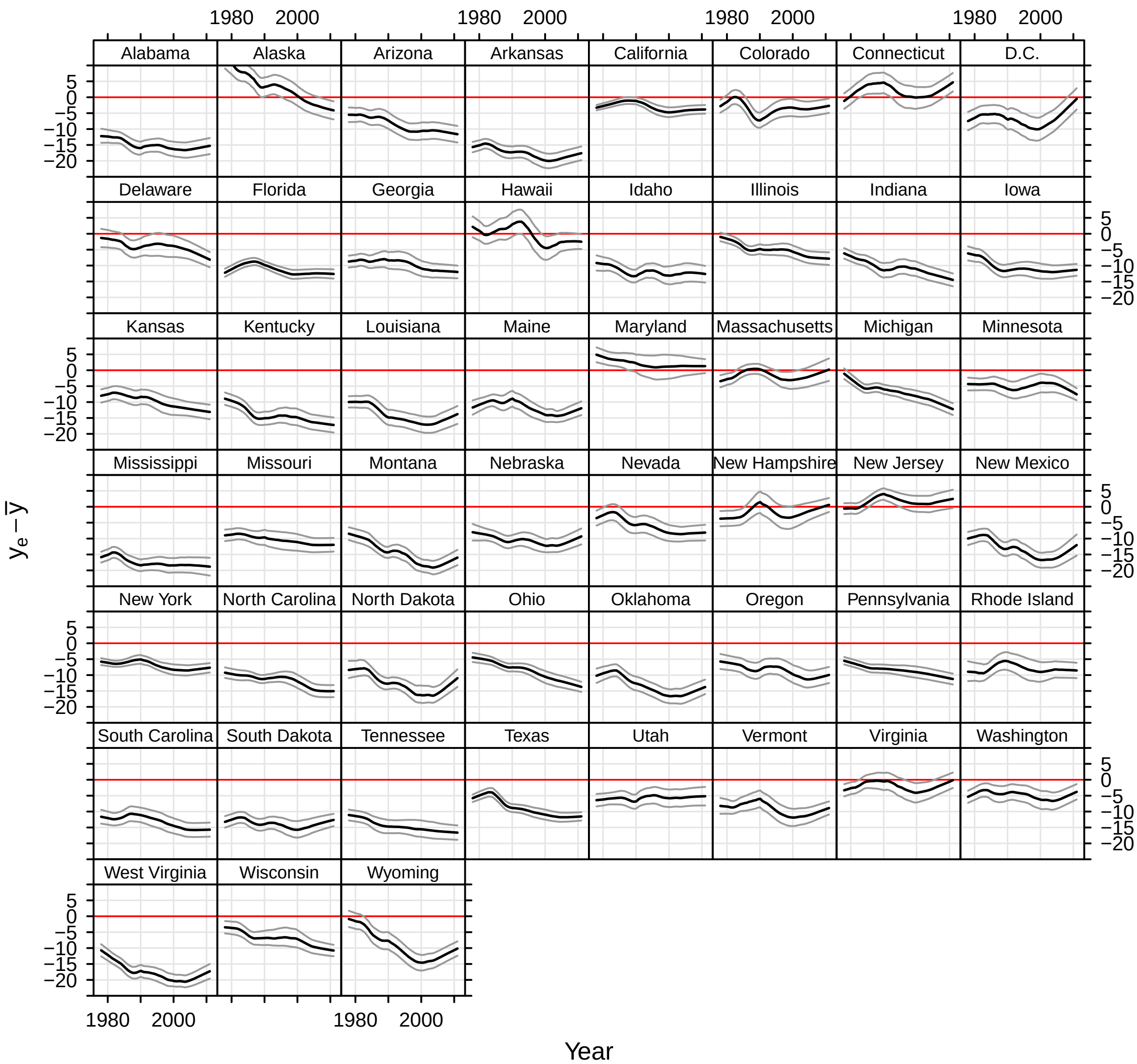

Figure I.1: Difference between state equally distributed equivalent income and national average income (with 95% confidence intervals). In 1000s of constant 1999 dollars.

Share of state income below national mean We calculate the share of household incomes in each state in each year that fall below the national average from March

CPS data. Household income data is adjusted for top-coding and sample inclusion probability, and deflated to 1999 as described in Section G. Figure I.2 shows that in each state, in each year, at least 40 percent of household incomes fall below the national mean income. Furthermore, there is slight evidence for a convergence over time: by year 2000 the share of incomes below the national mean is at least 50 percent in all states.

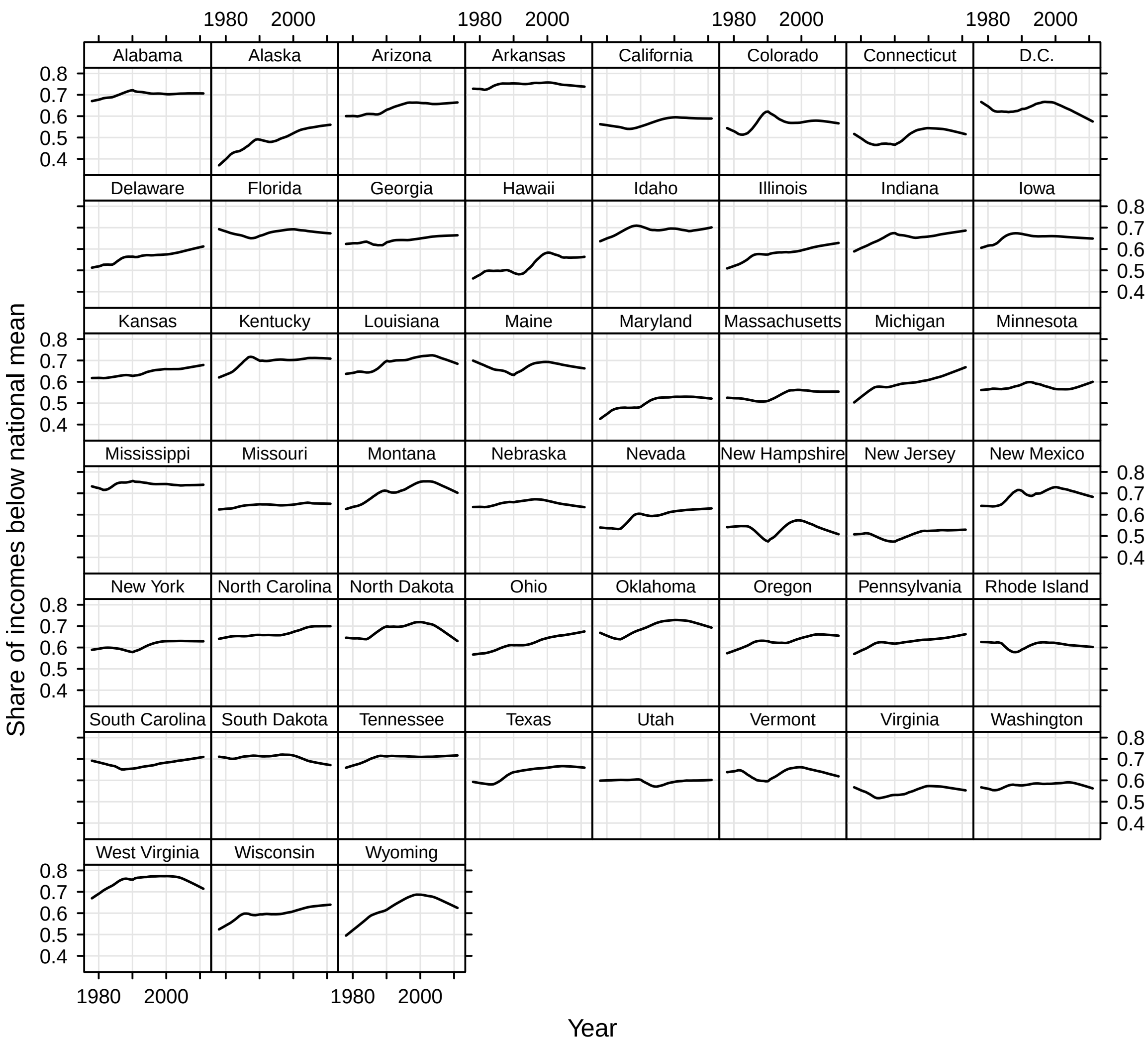

Figure I.2: Share of household incomes below the national mean in each state.

Federal transfers to citizens in states We calculate the average dollar amount of federal transfers received by an individual in a given state in a given year. We use data from the Bureau of Economic Analysis' Regional Economic Accounts, specifically the Annual series of State Personal Income and Employment, which is used by the federal government to allocate funds.[6] It includes detailed information on individuals' current transfer receipts (table SA35). We include budget items representing direct transfers from federal agencies to individuals in a state. Transfers to individuals from states' budgets (which are in part financed by the federal level) are not included. Included budget items are listed in Table I.1 below. We deflate transfer amounts to 1999 dollars and divide them by the state population to yield average transfers to individuals in a given state-year. Figure I.3 reproduces the conventional wisdom that the importance of federal transfers has increased over time. But it also shows that even in states receiving fewer transfers, national redistribution still matters. For example, in the late 70s even Alaska received almost 1,000 real dollars per inhabitant in federal transfers.

Table I.1: BEA federal transfer components included in federal transfer measure

2110	Social Security Benefits
2121	Railroad retirement and disability benefits
2210	Medicare benefits
2230	Military medical insurance benefits
2310	Supplemental Security Income (SSI)*
2330	Supplemental Nutrition Assistance Program
2421	Unemployment compensation for Fed. Civilian employees (UCFE)
2422	Unemployment compensation for railroad employees
2423	Unemployment compensation for veterans (UCX)
2424	Other unemployment compensation
2510	Veterans pension and disability benefits
2520	Veterans Readjustment benefits
2530	Veterans life insurance benefits
2600	Education and training assistance*
2700	Other transfer receipts of individuals from governments*

* Includes a small percentage of income that originates from state governments

[6] These state estimates of personal income are consistent with (i.e., sum to) the national estimates of personal income in the National Income and Product Accounts (NIPA).

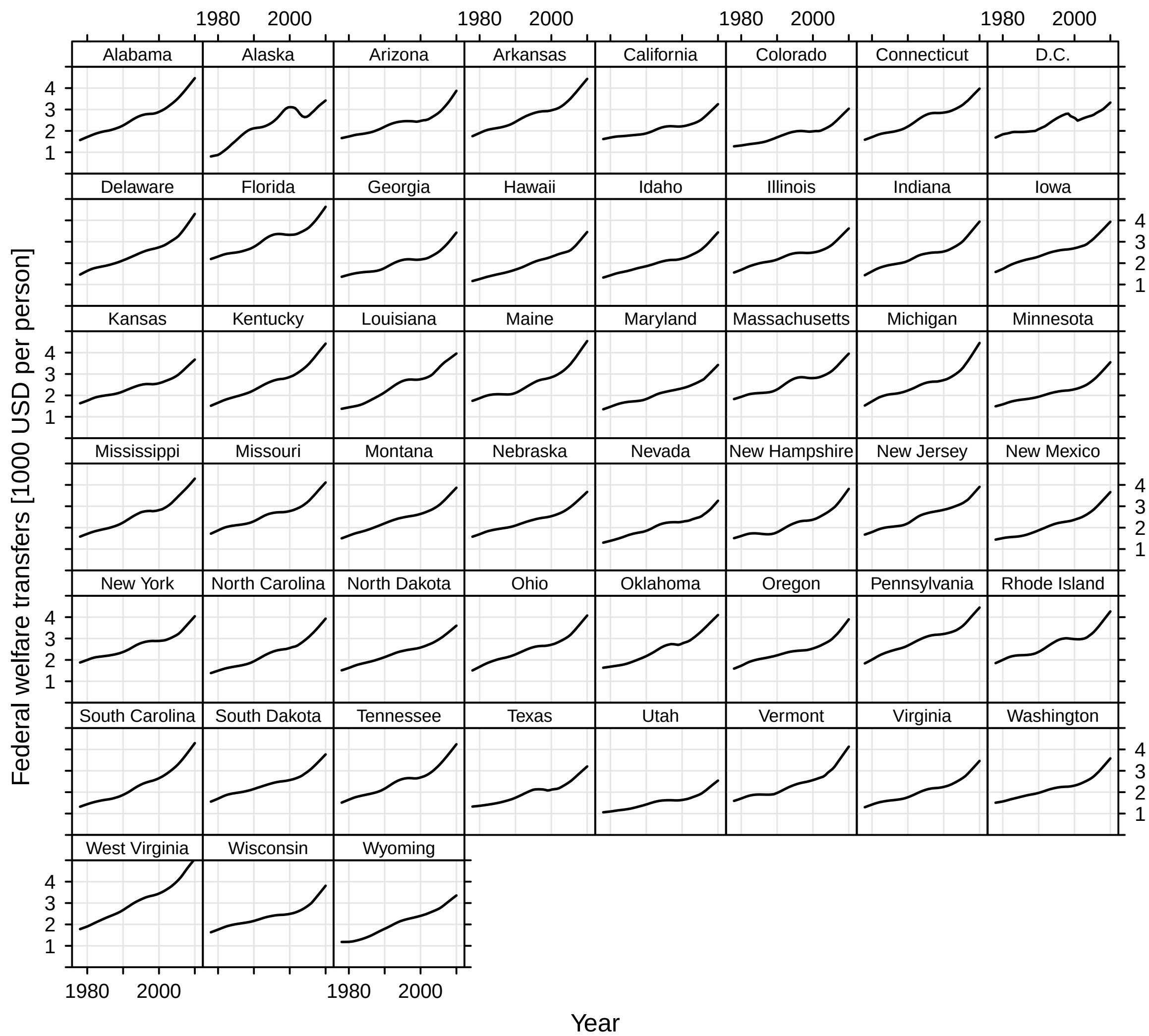

Figure I.3: Federal welfare transfers to individuals in state. Transfers per person in 1000s of constant 1999 dollars.

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