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Can Redistributive State Taxes Reduce Inequality?

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ABSTRACT

Do income taxes levied at a state or regional level affect the after-tax distribution of income? Or do workers merely move between regions, causing pre-tax wages to adjust? This question is relevant both in across states in the United States, and across countries within the European Union. Using the full income tax parameters for all US states from 1977-2002, I create a “simulated tax redistribution index”, which captures the mechanical impact of the changes in tax policy on the gini coefficient, but is exogenous to any behavioral response. Analyzing the effect of this redistribution index on inequality, I find that gross wages do not adjust so as to fully offset the effect of more redistributive taxes. Exploring the adjustment process further, I create a new class of tax redistribution measures, based on the S-Gini, which differentially weight effects at the bottom and top of the distribution, and conclude that neither taxes that particularly affect the rich or the poor seem to affect the distribution of wages. Redistributive taxes do not appear to affect interstate migration or total state personal income. From a political economy perspective, I also find some evidence that more inequality leads states to implement more redistributive taxes, which may help explain why earlier studies observed a positive relationship between redistribution and inequality.

Keywords: taxation, redistribution, progressivity, inequality, income distribution, Gini index, S-Gini index, interstate migration

JEL Classifications: H21, H23, H73, D63

1. Introduction

A common argument in the public finance literature is that redistribution should occur only at the national level (Musgrave 1959; Oates 1972). According to this argument, if state or local governments attempt to impose redistributive income taxes, cross-state mobility will lead to a compensating increase in gross wages for high-skill workers. If this is the case, then net wages for low-skill and high-skill workers will ultimately be unaffected by the increase in tax redistribution.

This argument suggests that more redistributive state taxes result in efficiency losses without achieving any net redistribution. If true, it suggests that states should focus on raising revenues in the most efficient manner possible, rather than attempting to redistribute between rich and poor. The hypothesis also has implications for labor market mobility within the European Union. Particularly between pairs of neighboring countries with a common language (eg. France and Belgium; Germany and Austria; Britain and Ireland), a rise in tax redistribution in one country may merely lead to cross-border migration, driving up pre-tax inequality, and leaving post-tax inequality unchanged.

What evidence exists to support this claim? One simple check is to look at the volume of cross-state migration in the US. In a given year, around 3 percent of those aged 20-29, and 2 percent of those aged 30-39, move to a different state (Rosenbloom and Sundstrom 2003). These cross-border flows are clearly of sufficient magnitude that they could cause gross wages to adjust to changes in tax redistribution – so long as tax rates were a factor in relocation decisions.[1]

Using data from the 1983 and 1989 Current Population Survey (CPS), Feldstein and Wrobel (1998) find that when states implement more redistributive income tax systems, wages become more unequal (ie. wages of high-skill workers rise by enough to offset the higher tax rates). They conclude that this adjustment process is rapid, and that tax rates in 1983 have no effect on gross wages in 1989. This is consistent with Blanchard and Katz (1992), who observe rapid migration out of high unemployment areas in response to adverse demand shocks, with the unemployment rate returning to normal after a period of six years.

Others, however, have found more modest effects. Focusing on the top end of the income distribution, and using annual tabulations of estate tax returns from 1965-98, Bakija and Slemrod (2004) conclude that high state inheritance and estate taxes and sales

[1] The figures for Europe are considerably smaller. For example, in 2002, just 0.2 percent of Britons left the country to live in another European Union nation (National Statistics 2004).

taxes have modest but significant negative impacts on the number of federal estate tax returns filed in a state. The rich do flee from higher state taxes, but the deadweight losses of this effect are small relative to the revenue raised. This is consistent with Conway and Houtenville (2001) who use migration data from the 1990 Census to investigate migration patterns of the elderly, and find that although those aged 65 and over are attracted to states with lower personal income and death taxes, the magnitude of the effect is small, and the results are sensitive to the particular specification chosen.

Similarly, studies of welfare and the EITC have not observed substantial effects at the lower end of the distribution. Cushing-Daniels (2004) uses the 1968-2002 Panel Study on Income Dynamics to study the impact of welfare generosity on mobility, and finds that benefits do not have a significant effect on cross-state migration. Leigh (2004) uses the 1989-2002 CPS to explore the impact of state Earned Income Tax Credits on earnings, and concludes that only a small portion of the observed effect could have been due to workers moving into states with more generous EITCs.

To assess the impact of redistributive taxes on gross earnings, I use the National Bureau of Economic Research's Taxsim program (Feenberg and Coutts 1993) to create a measure of the redistributive effect of personal income taxes across US states over the years 1977-2002. Separately calculating inequality from the March CPS over the same years, I find that more redistributive taxes are not associated with a commensurate increase in pre-tax inequality. The evidence on redistributive taxes and interstate migration is mixed, but there is no evidence that more redistributive taxes make states poorer. From a political economy perspective, I also find some evidence that more inequality leads states to implement more redistributive taxes, which may help explain the earlier finding of a positive relationship between redistribution and inequality.

The remainder of this paper is structured as follows. Section 2 outlines a simple model of tax redistribution and wages. Section 3 analyses the impact of redistributive taxes on inequality, using a standard measure of the redistributive effect of taxation. Section 4 proposes a new class of tax progressivity measures, based on the S-Gini, and uses these measures to see whether the effect of taxes on gross wages has a stronger effect on the top or bottom of the distribution. Section 5 studies the effect of tax progressivity on migration, post-tax inequality, and incomes. Section 6 delves into the political economy of redistributive taxation, and the final section concludes.

2. A Simple Model of Tax Redistribution and Wages

To see the effect of a change in tax redistribution on wages, I assume two labor markets – one for low-skill employees, and one for high-skill employees. Using a standard semi-log formulation for labor supply, tax changes affect labor supply in two ways – through the marginal tax rate (the substitution effect) and through virtual income (the income effect). Consider first the marginal tax rate effect. Assuming tax-induced changes in wages have no effect on prices, we can write the relationship between the post-tax hourly wage (w) and the pre-tax hourly wage (W) and the average tax rate (τ) for group j (where j=L or H) as:

$$w_j = W_j\left(1-\tau_j\right) \tag{1}$$

Taking natural logs of both sides, and differentiating:

$$\frac{dw_j}{w_j} = \frac{dW_j}{W_j} - \frac{d\tau_j}{1-\tau_j} \tag{2}$$

Now, recalling the relationship between total labor supply (L_S), the uncompensated elasticity of labor supply (η_S), and the post-tax wage for group j:

$$\frac{dL_{Sj}}{L_{Sj}} \equiv \eta_{Sj}\frac{dw_j}{w_j} \tag{3}$$

Equation (3) can be rewritten in terms of the pre-tax wage and the average tax rate:

$$\frac{dL_{Sj}}{L_{Sj}} = \eta_{Sj}\left(\frac{dW_j}{W_j} - \frac{d\tau_{Aj}}{1-\tau_{Aj}}\right) \tag{4}$$

Next, it is necessary to take account of the impact that virtual income has on labor supply. Virtual income is defined as V≡(Y+U)-T-(1-τ_M)Y, where τ_M is the marginal tax rate, Y is annual earned income, T is total tax liability, and U is unearned income. This simplifies to V= τ_MY-τ_A(Y+U)+U. Where ζ is the virtual income elasticity, we can add in the virtual income effect:

$$\frac{dL_{Sj}}{L_{Sj}} = \eta_{Sj}\left(\frac{dW_j}{W_j} - \frac{d\tau_{Aj}}{1-\tau_{Aj}}\right) + \zeta_j \frac{dV_j}{V_j} \tag{5}$$

At this point, models of tax incidence typically assume that taxation revenue is returned to households in a lump sum fashion, and therefore that the income effect is zero. While this may be a reasonable assumption for an analysis of payroll taxation, it is difficult to justify ignoring income effects in the case of redistributive taxes. Particularly in the case of state Earned Income Tax Credits, which represent a net transfer from the government to the individual (rather than the other way around), income effects are likely to be important.

Assuming that workers within group j are perfectly substitutable for one another, the relationship between total labor demand (L_D), the elasticity of labor demand (η_D), and the pre-tax wage will be:

$$\frac{dL_{Dj}}{L_{Dj}} \equiv \eta_{Dj}\left(\frac{dW_j}{W_j}\right) \tag{6}$$

Setting the change in labor supply equal to the change in labor demand shows how the equilibrium wage will be affected by a change in the tax rate for group j.

$$\frac{dW_j}{W_j} = \frac{\eta_{Sj}\frac{d\tau_{Aj}}{1-\tau_{Aj}} - \zeta_j \frac{dV_j}{V_j}}{\eta_{Sj} - \eta_{Dj}} \tag{7}$$

With the standard assumptions η_S>0, η_D<0 and ζ<0 for both groups, we can sign the effect on gross wages for low-skill and high-skill workers if redistribution rises.

A more redistributive tax implies $\tau_{AL}\downarrow$, $V_L\uparrow$, which will lead to a decrease in the first term in the numerator, and an increase in the second term. The average tax rate effect will place downward pressure on low-skill wages, while the virtual income effect will place upwards pressure on low-skill wages. The effect on W_L is therefore ambiguous.

Likewise, for low-skilled workers, a more redistributive tax implies $\tau_{AH}\uparrow$, $V_H\downarrow$, which will lead to an increase in the first term in the numerator, and a decrease in the second term. The average tax rate effect will place upward pressure on high-skill wages, while the virtual income effect will place downwards pressure on high-skill wages – making the impact on W_H ambiguous.

Thus far, the manner in which the effect of taxes has been modeled would be equally applicable to federal income taxes and state income taxes. The difference is in the elasticity of labor supply, which will be higher in the case of state income taxes than in the case of federal income taxes. To see this, note that we can decompose the change in labor supply (dL_S) into the change due to participation (dP_j) and the change due to immigration (I_j):

$$\eta_{Sj} = \frac{\frac{dP_j + I_j}{L_{Sj}}}{\frac{dw_j}{w_j}} \tag{8}$$

In the case of a change in US federal income tax rates, it is likely that $I_j \approx 0$, due to constraints on the quantity of immigrants able to enter the US and the high cost of international moves. By contrast, $I_j > 0$ for changes in US state income tax rates (interstate moves in the US are relatively straightforward), and hence η_{Sj}(state)>η_{Sj}(federal). From this, we can derive the result from Mirrlees (1982): the optimal amount of redistribution by a state is a declining function of the degree of mobility in response to taxes. If I_j(state) is constrained to be zero, there is no efficiency loss from a state implementing a more redistributive taxation system.

How large are these migration effects? Feldstein and Wrobel (1998) begin from the proposition that net wages for skill groups (w_j) must be the same across states, which implies that η_{Sj}(state)=∞ (labor supply is perfectly elastic across states). So as η_{Sj}(state)→∞.

$$\frac{dW_j}{W_j} \rightarrow \frac{d\tau_{Aj}}{1-\tau_{Aj}} \tag{9}$$

This implies that the change in the gross wage must be equivalent to the change in the tax rate, and therefore that the only result of a more redistributive tax will be to boost pre-tax wage inequality in a state.

Equation (9) rests strongly on the presumption that at the margin, labor supply is perfectly elastic across states. But as a theoretical matter, this need not be true. The effective cost of moving is likely to be significantly larger than the expense of relocation, since many people put a high value on remaining in close proximity to friends and family.[2] The fact that households must make joint decisions on location will frequently constrain mobility choices. And since households must make locational decisions based upon the expected lifetime utility stream that flows from an alternative location (Harris and Todaro 1970), a given tax change may not cause them to migrate if they believe that there is a reasonable chance that the tax policy will be reversed in the future. If these costs are sufficiently large, then in the short run (and perhaps even in the longer run), the marginal worker will prefer to accept a lower net wage in his or her current state than move interstate for a higher net wage.

3. How do Redistributive Taxes Affect the Pre-Tax Gini Coefficient?

To test the impact of redistributive taxation on inequality, Feldstein and Wrobel (1998) regress an individual's gross hourly wage on his or her average tax rate, using data from 1983 and 1989. Since the average tax rate is endogenous to hourly earnings, they instrument for the actual average tax rate with a predicted average tax rate, based on demographic characteristics. A more reduced form approach, which will be implemented here, is to regress a measure of the distribution of hourly wages on a measure of tax redistribution, controlling for state and year fixed effects, and for certain time-varying state characteristics.

What is the appropriate measure of the redistributive effect of taxation? For simplicity, I adapt the Reynolds-Smolensky index (Reynolds and Smolensky 1977), which simply measures the amount by which taxation changes the Gini coefficient. Where GA and GB are the Gini coefficients for after-tax and before-tax income respectively, RS index = GA-GB. To obtain a measure that is increasing with the redistributive effect, I swap the terms to obtain the index GB-GA.

[2] So long as there is sufficient variation across "skill" over generations (ie. some high-skill parents beget low-skill children, and vice-versa), parents cannot optimize for subsequent generations.

Redistributive taxes will potentially affect inequality via two channels. First, because taxes typically take a larger income share of the rich than the poor, tax policies will have a 'mechanical' effect on inequality. Second, redistributive taxes may engender a behavioral response – for example, by prompting changes in labor supply or affecting residential choices. In measuring the effect of tax policies on behavior, it is important to form an index of redistribution that measures only the *mechanical policy effect* of a tax, uncontaminated by any *behavioral response*. To do this, I calculate the redistributive effect of taxation based not upon the actual after-tax Gini and before-tax Gini in a given state and year, but based on the effect of the taxation system in every state and year on one single sample of households, drawn from the March 1990 CPS. This "simulated redistribution index" reflects the mechanical policy impact of the taxation system, but not any behavioral changes that are induced by a more or less redistributive tax system.

The measure of redistribution used here accounts only for personal income taxes. In particular, it does not include property taxes, sales taxes, and estate taxes, which may be a significant factor affecting locational decisions. To the extent that the redistributive effect of personal income taxes is positively correlated with the redistributive effect of other taxes, mine will be an underestimate of the true effect. To the extent that the redistributive effect of personal income taxes is negatively correlated with the redistributive effect of other taxes, mine will be an underestimate. However, it is somewhat reassuring to note that Feldstein and Wrobel (1998) found that omitting sales tax information makes only a slight difference to their estimates.

Both the redistributive effect of taxation and income inequality are calculated from the distribution of hourly wages among adults aged 16-55 with positive earnings. The mean of the pre-tax Gini coefficient for the distribution of hourly wages is 0.35 with a standard deviation of 0.018. Within a state, the largest one-year movements observed in the data are -5 Gini points and +6 Gini points. At the 10th and 90th percentiles, the one-year movements are -2 and +2 Gini points respectively.

On average, the mechanical effect of income taxes was to reduce the Gini coefficient by 0.024 (ie. by 2.4 Gini points), with a standard deviation of 0.003. However, this standard deviation overstates the extent of within-state variation in the redistributive effect of taxation. Focusing only on one-year within-state changes, the largest increase and decrease observed in the data are -0.4 and +0.4 Gini points. The changes at the 10th and 90th percentiles are -0.2 Gini points and +0.1 Gini points respectively.

Figures 1 and 2 depict scatter plots of the Gini and the redistributive effect of taxation. More detail on variable construction may be found in the Data Appendix.

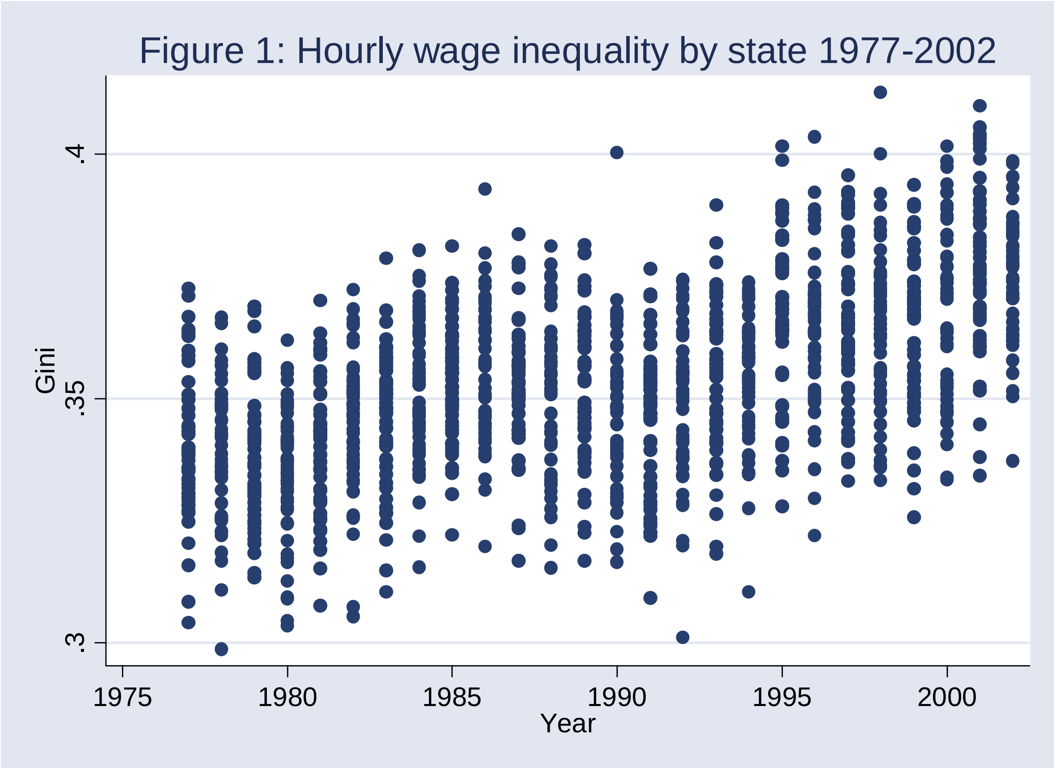


Figure 1: Hourly wage inequality by state 1977-2002

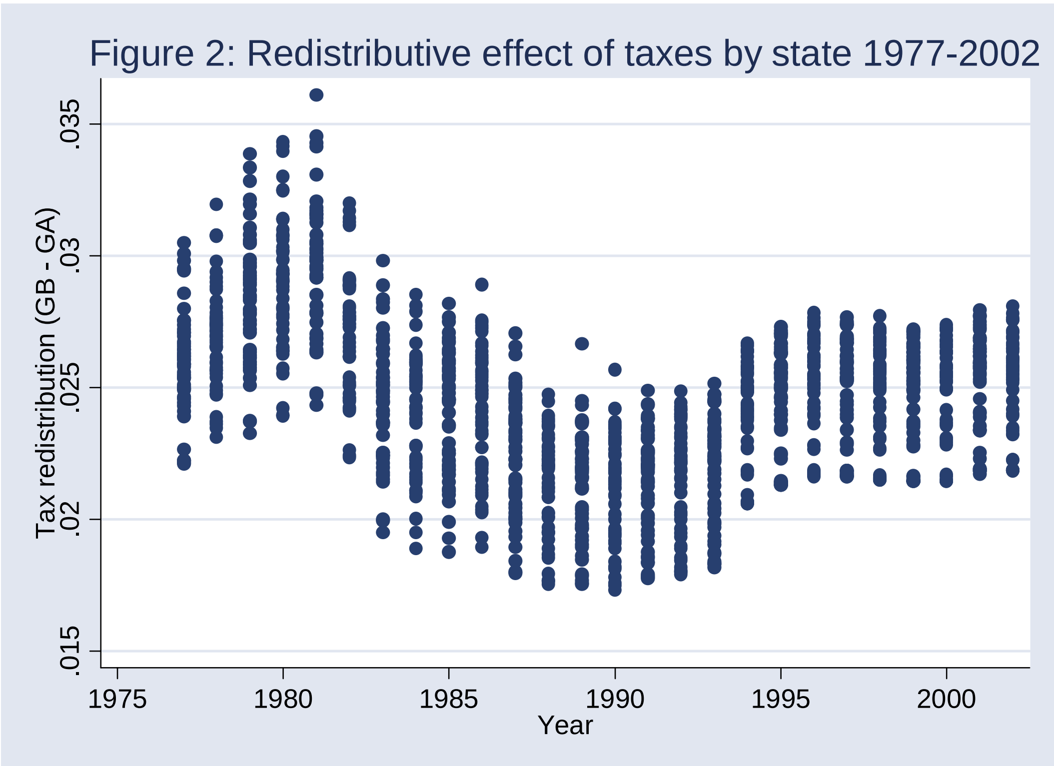


Figure 2: Redistributive effect of taxes by state 1977-2002

Where $(\dot{G}B–\dot{G}A)$ is the amount by which taxation mechanically reduces the Gini coefficient, GB is the Gini coefficient for before-tax inequality, Z are time-varying state characteristics (the unemployment rate and the log of real per capita personal income), ζ is a vector of state dummies, λ is a vector of year fixed effects, and T_r is a region-specific linear time trend, I estimate the following equation:

$$GB_{st} = \alpha + \beta(\dot{G}B–\dot{G}A)_{st} + Z_{st} + \zeta_s + \lambda_t + T_r + \varepsilon_{st} \qquad (10)$$

Note that the year dummies effectively parse out changes in federal income tax redistribution, leaving only the effects of state income taxes. This approach is preferable to estimating the redistributive effect of state taxes alone, since it allows for interaction between state and federal taxes. Including a region-specific linear time trend allows for the possibility that long-run linear changes within one of the nine Census divisions – due to changing industrial composition or regional economic shocks – might have affected both inequality and taxation systems. Standard errors are clustered at the state level, allowing for an arbitrary covariance structure over time within each state (Bertrand, Duflo and Mullainathan 2002).

The coefficient on β now has a straightforward interpretation. If β=1, then a tax system that has the mechanical effect of reducing the Gini by one point leads to a compensating 1 Gini point increase in the pre-tax distribution of income, with the net result being that the after-tax distribution of income remains unaffected by the redistributive effects of the tax. If β=0, tax redistribution has no impact on the pre-tax distribution of income. And if β=-1, then a tax system that has the mechanical effect of reducing the Gini by 1 point *also* leads to a further 1 Gini point decrease in the pre-tax distribution of income.

Table 1 shows the effect of redistribution on the pre-tax distribution of income. Looking only at the contemporaneous effect of redistribution (column 1), the relationship is positive, though not significant. To test the impact of past tax redistribution on current inequality, I experiment with including two, four, six, and nine lags of the tax redistribution index. For example, in the case of nine lags, I estimate the equation:

$$GB_{st} = \alpha + \beta1(\dot{G}B–\dot{G}A)_{st} + \beta2(\dot{G}B–\dot{G}A)_{st-1} + \ldots + \beta10(\dot{G}B–\dot{G}A)_{st-9} + Z_{st} + \zeta_s + \lambda_t + T_r + \varepsilon_{st} \qquad (11)$$

Table 1: How do Redistributive Taxes Affect the Distribution of Income?
Dependent variable: Gini coefficient for pre-tax hourly wages

	(1)	(2)	(3)	(4)	(5)
Tax redistribution$_t$	1.112	0.059	0.05	-0.176	0.294
	[0.723]	[0.763]	[0.773]	[0.963]	[1.214]
Tax redistribution$_{t-1}$		0.685	1.022	1.053	1.325
		[0.670]	[0.828]	[0.838]	[1.258]
Tax redistribution$_{t-2}$		-0.054	-0.432	0.034	-0.461
		[0.670]	[0.943]	[0.939]	[1.368]
Tax redistribution$_{t-3}$			-0.337	-0.123	0.15
			[0.624]	[0.945]	[1.147]
Tax redistribution$_{t-4}$			-0.543	-1.495*	-1.428
			[0.754]	[0.781]	[1.066]
Tax redistribution$_{t-5}$				0.421	1.187
				[0.620]	[0.880]
Tax redistribution$_{t-6}$				-0.882	-0.855
				[0.804]	[1.152]
Tax redistribution$_{t-7}$					-1.715**
					[0.732]
Tax redistribution$_{t-8}$					-0.198
					[0.637]
Tax redistribution$_{t-9}$					-0.191
					[0.636]
Unemployment rate	0.002***	0.002***	0.001**	0.001*	0.002**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Log real per capita income	-0.006	-0.01	-0.007	-0.005	-0.002
	[0.021]	[0.022]	[0.025]	[0.024]	[0.035]
State and year fixed effects?	Yes	Yes	Yes	Yes	Yes
Region-specific time trend?	Yes	Yes	Yes	Yes	Yes
Average of all redistribution coefficients		**0.23**	**-0.05**	**-0.17**	**-0.19**
		[0.33]	**[0.23]**	**[0.17]**	**[0.13]**
Observations	1326	1224	1122	1020	867
R-squared	0.64	0.64	0.61	0.61	0.62

Note: Robust standard errors, clustered at the state level, in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively. 'Tax Redistribution' is the negative of the Reynolds-Smolensky index, calculated as ĠB-ĠA (see text for details).

In each case, the average of the redistribution coefficients is statistically indistinguishable from zero, suggesting that a more redistributive taxation system does not affect the pre-tax distribution of wages, as measured by the gini coefficient. The standard errors make it possible to reject the hypothesis that wages fully adjust to changes in tax redistribution. Full adjustment of wages over a 10-year period would imply that the average of β1:β10 was 1. But in column 5, the point estimate of the summed effect of tax redistribution is -0.19, with a 95 percent confidence interval from -0.44 to 0.06.

4. <u>How do Redistributive Taxes Affect the Top and Bottom of the Income Distribution?</u>

While the results in section 3 suggest that more redistributive taxes do not cause the distribution of gross wages to fully adjust, it is possible that a stronger impact is felt by tax reforms that affect either the bottom or top of the distribution. This would make it possible to see whether the poor or the rich were particularly sensitive to tax changes. A straightforward way to test this is to use a measure of income distribution that places more weight on one or other of the ends of the distribution. A natural choice is the S-Gini (Donaldson and Weymark 1980), a scale-free index that allows for a flexible inequality aversion parameter, δ, which determines the social weight to be applied to parts of the distribution.

Where L(p) is the area under the Lorenz Curve, representing the proportion of total income going to the bottom fraction p of a population with individual income y and mean income μ:

$$L(p) = \frac{1}{\mu}\int_0^{Q(p)} y.dF(y) \tag{12}$$

the S-Gini is given by the formula:

$$SG_\delta = 1 - \delta(\delta - 1)\int_0^1 (1-p)^{\delta-2} L(p)d(p) \tag{13}$$

Where $y_{1:n} \le y_{2:n} \le \ldots \le y_{n:n}$ are the order statistics for income of n individuals, a consistent estimator for the S-Gini is:

$$SG_\delta = 1 - \frac{1}{\mu n^\delta}\sum_{i=1}^{n}\left((n-i+1)^\delta - (n-i)^\delta\right) y_{i:n} \tag{14}$$

For δ≤1, the S-Gini is undefined. For 1<δ<2, the index places more weight on the top of the distribution, while for δ>2, the index places progressively more weight on the bottom of the distribution. When δ=2, the S-Gini is identical to the Gini coefficient (for a more detailed discussion, see Lambert 1993; Barrett and Donald 2000; Zitikis and Gastwirth 2002).

It is therefore straightforward to use the S-Gini to develop alternative measures of the redistributive effect of taxation, weighting the top and bottom of the distribution differently. In section 3, estimates were presented for a redistribution measure based on the Gini coefficient (δ=2):

$$P_2 = S\dot{G}B_2 – S\dot{G}B_2 = \dot{G}B – \dot{G}A \qquad (15)$$

Here, I present four alternative measures of redistributive effect; two which place more weight than the Gini-derived measure on the top of the income distribution:

$$P_{1.25}=S\dot{G}B_{1.25}–S\dot{G}A_{1.25} \qquad (16)$$

$$P_{1.5}=S\dot{G}B_{1.5}–S\dot{G}A_{1.5} \qquad (17)$$

And two which place more weight than the Gini-derived measure on those at the bottom of the income distribution:

$$P_{2.5}=S\dot{G}B_{2.5}–S\dot{G}A_{2.5} \qquad (18)$$

$$P_{3.5}=S\dot{G}B_{3.5}–S\dot{G}A_{3.5} \qquad (19)$$

Summary statistics for each measure are presented in Appendix Table 1.

In each instance, I estimate the impact on the corresponding pre-tax S-Gini coefficient, with current redistribution and nine lags as the independent variables of interest. For example, in the case of the redistribution measure where δ=1.25, I estimate the equation:

$$SGB_{1.25,\,st} = \alpha + \beta 1(S\dot{G}B_{1.25}–S\dot{G}A_{1.25})_{st} + \beta 2(S\dot{G}B_{1.25}–S\dot{G}A_{1.25})_{st-1} + \ldots \qquad (20)$$
$$+ \beta 10(S\dot{G}B_{1.25}–S\dot{G}A_{1.25})_{st-9} + Z_{st} + \zeta_s + \lambda_t + \varepsilon_{st}$$

The interpretation of β is therefore analogous to Section 3. If β=1, then a tax system that has the mechanical effect of reducing the S-Gini$_\delta$ leads to a behavioral change that increases the S-Gini$_\delta$ by the same amount, while if β=0, the redistributive effect of taxation, as measured by the change in the S-Gini$_\delta$, has no impact on the distribution of gross wages.

Table 2 shows the results using the four alternative redistribution indices. While the effect of tax-induced redistribution on wages appears to be slightly stronger at the top of the distribution, there is little difference between the four specifications. As with the gini-derived redistribution measure (δ=2), the effect of tax redistribution on wages is approximately zero. The confidence intervals on the estimate for the average of all redistribution coefficients makes it possible to reject, at the 95 percent confidence level, the hypothesis that the average of $\beta 1:\beta 10$ is 1.

Table 2: How do Redistributive Taxes Affect the Top and Bottom of the Income Distribution?
Dependent variable: S-Gini coefficient for pre-tax hourly wages

	(1)	(2)	(3)	(4)
	δ=1.25	δ=1.5	δ=2.5	δ=3.5
	More weight on top of distribution than Gini		More weight on bottom of distribution than Gini	
Tax redistribution$_t$	-0.282	0.013	0.325	0.067
	[1.401]	[1.300]	[1.181]	[1.171]
Tax redistribution$_{t-1}$	1.623	1.502	1.201	1.049
	[1.256]	[1.231]	[1.310]	[1.414]
Tax redistribution$_{t-2}$	-1.348	-0.943	-0.183	0.133
	[1.523]	[1.439]	[1.362]	[1.408]
Tax redistribution$_{t-3}$	0.839	0.542	-0.098	-0.401
	[1.179]	[1.135]	[1.220]	[1.410]
Tax redistribution$_{t-4}$	-0.916	-1.164	-1.579	-1.778*
	[1.167]	[1.113]	[1.045]	[1.036]
Tax redistribution$_{t-5}$	1.488	1.369	1.067	0.949
	[0.964]	[0.904]	[0.910]	[1.021]
Tax redistribution$_{t-6}$	-0.758	-0.843	-0.78	-0.569
	[1.225]	[1.173]	[1.183]	[1.309]
Tax redistribution$_{t-7}$	-1.767*	-1.728**	-1.758**	-1.944**
	[0.900]	[0.799]	[0.741]	[0.824]
Tax redistribution$_{t-8}$	-0.354	-0.324	-0.064	0.159
	[0.712]	[0.659]	[0.653]	[0.708]
Tax redistribution$_{t-9}$	-0.187	-0.225	-0.099	0.132
	[0.713]	[0.676]	[0.625]	[0.650]
Unemployment rate	0.000	0.001	0.002**	0.002***
	[0.000]	[0.001]	[0.001]	[0.001]
Log real per capita income	0.000	0.000	-0.007	-0.013
	[0.017]	[0.026]	[0.037]	[0.038]
State and year fixed effects?	Yes	Yes	Yes	Yes
Region-specific time trend?	Yes	Yes	Yes	Yes
Average of all redistribution coefficients	**-0.17**	**-0.18**	**-0.20**	**-0.22***
	[0.14]	**[0.13]**	**[0.12]**	**[0.12]**
Observations	867	867	867	867
R-squared	0.65	0.63	0.62	0.62

Note: Robust standard errors, clustered at the state level, in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively. 'Tax Redistribution$_{\delta,t}$' is calculated as $S\dot{G}B_\delta$-$S\dot{G}A_\delta$ (see text for details).

Perhaps puzzlingly, when the most weight is placed on the bottom of the distribution, more redistributive taxes appear to be associated with a more equal distribution of pre-tax wages, though the coefficient is small and only significant at the 10 percent level. One possible explanation for this result is that states with more redistributive taxes may use the additional revenue to create jobs for low-skilled workers.[3]

5. Migration, Income and Post-Tax Inequality

In the previous two sections, I found that the redistributive effect of state taxes had no significant impact on the pre-tax distribution of hourly wages. Here, I consider three other parts of the story: the impact of tax redistribution on mobility, *post-tax* inequality, and personal income.

First, does the redistributive effect of taxation tax drive interstate mobility? To test this, I use six measures of population mobility: the fraction of a state's adult population that moved in from another state during the year, the fraction of a state's population that has moved out to another state during the year, the ratio of in-movers' hourly wages to non-movers' wages, the ratio of out-movers' hourly wages to non-movers' wages, the log of the state population, and the percentage change in the state's population in that year. It should be noted that the first four measures are taken from the March CPS, and therefore that measures in year T relate to migration not from January T to December T, but from March T until March T+1.[4]

As in earlier tables, all these specifications include state fixed effects, year fixed effects, and region-specific linear time trends. Note that state fixed effects have a different effect in specification (5) and specification (6). In column (5), the state fixed effect absorbs unobservable state-specific factors affecting the *growth rate* of a state's population, while in column (6), the state fixed effect absorbs unobservable state-specific factors affecting the *level* of a state's population.

Table 3 focuses only on the effects in the year of the tax change and the following four years, since it seems reasonable to expect that most migration will occur during this window. Specifications (1) to (4) use CPS data and indicate that more redistributive taxes have no effect on population flows, or on the relative wages of movers. Column (5), which calculates population flows from year-to-year changes in population stocks, supports this finding. However, column (6) suggests that when the dependent variable is

[3] Another possibility is that state earned income tax credits had a particular effect on the earnings distribution. However, when the sample is split into states with and without earned income tax credits, the results are similar for both groups.

[4] One possible solution would be to convert the March T to March T+1 data into January T to December T data by the simple formula: X(Jan T: Dec T) = 0.25*X (Mar T-1: Mar T) + 0.75*X(Mar T: Mar T+1). Unfortunately, because mobility rates are missing for several years, this kind of averaging reduces the sample size too severely.

the level of the state population, more redistributive taxes are associated with a smaller population size. A one standard deviation increase in the redistributive effect of a state's tax system – sustained over a five-year time horizon – is associated with a 1.2 percent decrease in state population.

Table 3: Does tax redistribution drive interstate migration?

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Incoming migration rate	Outgoing migration rate	Wage ratio: incoming/ nonmovers	Wage ratio: outgoing/ nonmovers	Population growth rate	Log population
TR_t	-1.182	-0.348	8.001	-10.746	-0.634	-9.027***
	[0.782]	[0.782]	[12.303]	[17.324]	[0.456]	[3.328]
TR_{t-1}	1.028	-1.261	-11.152	48.173**	0.448	-2.01
	[1.172]	[0.847]	[14.271]	[22.240]	[0.403]	[1.894]
TR_{t-2}	-2.140*	-0.206	6.928	-14.473	-1.161**	-0.675
	[1.151]	[0.819]	[16.166]	[16.059]	[0.452]	[2.589]
TR_{t-3}	0.47	0.244	-3.084	-3.416	0.254	-2.902*
	[0.983]	[0.794]	[12.781]	[14.666]	[0.611]	[1.646]
TR_{t-4}	1.215	0.148	5.232	-4.293	0.709*	-5.413
	[1.097]	[0.759]	[12.728]	[12.491]	[0.408]	[4.484]
Unemp. rate	-0.002***	0.001*	-0.011	0.009	-0.002***	0.005
	[0.000]	[0.001]	[0.007]	[0.009]	[0.000]	[0.004]
Log real per capita income	0.067***	0.013	-0.469**	-0.536*	0.071***	0.226
	[0.019]	[0.021]	[0.178]	[0.298]	[0.016]	[0.140]
State and year FE?	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific time trend?	Yes	Yes	Yes	Yes	Yes	Yes
Average of redistrib coefs	**-0.12**	**-0.28**	**1.19**	**3.05**	**-0.08**	**-4.01****
	[0.16]	**[0.22]**	**[2.64]**	**[2.82]**	**[0.10]**	**[1.94]**
Observations	1020	1020	1020	1019	1122	1122
R-squared	0.73	0.71	0.15	0.12	0.66	0.99

Note: Robust standard errors, clustered at the state level, in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively. 'TR' is the negative of the Reynolds-Smolensky index, calculated as $\dot{G}B$-$\dot{G}A$ (see text for details). Dependent variables in columns (1) to (4) are measured from $March_t$ to $March_{t+1}$

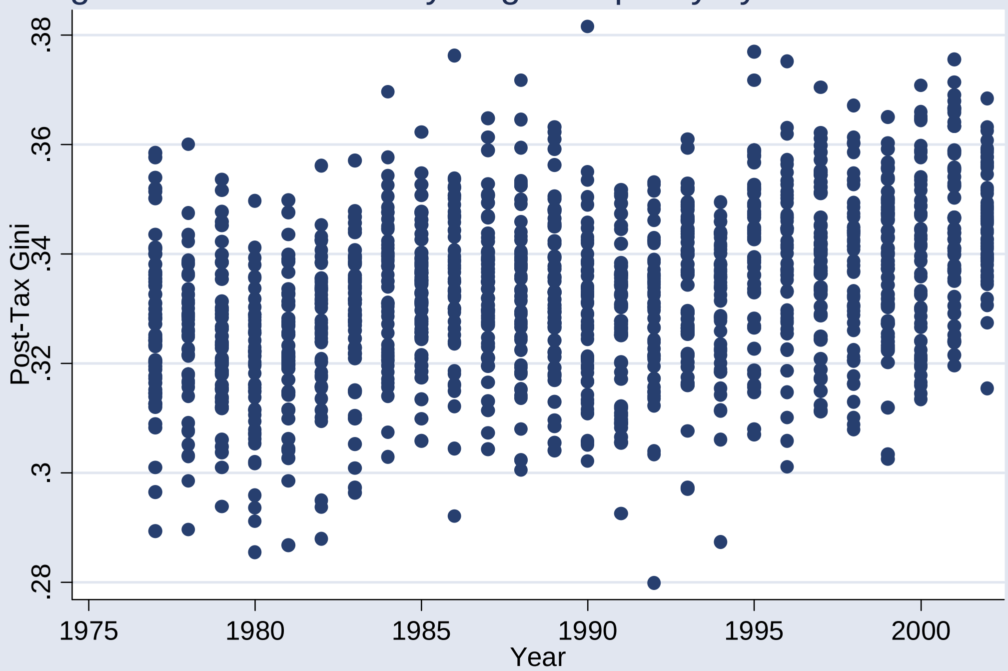
The difference between columns (5) and (6) is that when the dependent variable is population *change*, the state and year fixed effects absorb a given rate of change in each state and year; but when the dependent variable is the level of the population, the fixed effects absorb only a given level of population. One way of summing up the two findings is that states with more redistributive taxes grow more slowly, but that a move to a more redistributive tax does not slow the rate of population growth. It appears that the relationship between redistribution and population is fragile at best, since it is not robust to using changes rather than levels as the dependent variable.

I now turn to the question of how redistributive taxes affect income and the post-tax distribution of income. This question is particularly pertinent in the light of Feldstein and Wrobel's conclusion:

> "[T]here can be no trade-off at the state level between distribution goals and economic efficiency. Shifts in state tax progressivity, by altering the structure of employment in the state and distorting the mix of labor inputs used by firms in the state, create deadweight efficiency losses without achieving any net local redistribution of real incomes." (1998, 392)

Using a similar empirical approach to that used to analyze migration, it is possible to directly test the impact of more redistributive state taxation systems have on post-tax inequality and income. Post-tax inequality figures are measured from the same March CPS surveys as were used to calculate pre-tax inequality. However, in this case, annual earnings and family characteristics are first used to calculate each individual's average tax rate (ATR), and the pre-tax hourly wage is then multiplied by {1-ATR} to arrive at a post-tax hourly wage. Within each state, I then calculate the distribution of these post-tax hourly wages. Figure 3 shows the post-tax Ginis, which have a mean of 0.33 and a standard deviation of 0.015.

Figure 3: Post-tax hourly wage inequality by state 1977-2002



Personal income is the log of real state personal income, and the log of real state personal income per capita, both from the Bureau of Economic Analysis.

With regard to the distribution of post-tax hourly wages, the results from column (1) of Table 4 are similar to those for the distribution of pre-tax hourly wages. Averaged over 10 years, there is some suggestion that more redistributive taxes may lead to a more equal distribution of hourly wages, but the coefficient is small and statistically significant only at the 10 percent level. As to the potential efficiency cost of more redistributive taxes, the summed coefficient in column (2) is negative, but statistically indistinguishable from zero. However, since the standard error is large (the 95 percent confidence interval ranges from -2.9 to 1.8), it is not possible to reject with any confidence the contention of Feldstein and Wrobel that redistributive state taxes have a high efficiency cost. When the dependent variable is switched to personal income per capita, incomes are found to be significantly higher in more redistributive states. A one standard deviation increase in redistribution is associated with a 0.4 percent increase in per capita income. Given the findings in column (2), it seems improbable that this reflects any increase in efficiency in states with more redistributive taxes – more likely, it is primarily due to the fall in population experienced by such states.

Table 4: How do Redistributive Taxes Affect Post-Tax Inequality and Average Income

	(1)	(2)	(3)
Dependent variable:	Post-Tax Gini for Hourly Wages	Log Real State Personal Income	Log Real Personal Income per Capita
Tax redistribution$_t$	0.296	-6.346	0.856
	[1.162]	[4.007]	[2.336]
Tax redistribution$_{t-1}$	0.906	5.804*	3.034
	[1.295]	[3.258]	[1.937]
Tax redistribution$_{t-2}$	-0.395	0.046	4.255**
	[1.302]	[2.858]	[1.662]
Tax redistribution$_{t-3}$	-0.02	2.835	2.853**
	[1.160]	[1.926]	[1.390]
Tax redistribution$_{t-4}$	-1.355	-0.081	2.077
	[1.013]	[2.957]	[1.392]
Tax redistribution$_{t-5}$	1.311	-1.765	-0.61
	[0.839]	[1.792]	[1.029]
Tax redistribution$_{t-6}$	-1.146	0.779	2.169
	[1.076]	[2.411]	[1.403]
Tax redistribution$_{t-7}$	-1.263*	-4.595*	-2.878*
	[0.720]	[2.468]	[1.706]
Tax redistribution$_{t-8}$	-0.361	1.488	1.636
	[0.630]	[2.697]	[1.573]
Tax redistribution$_{t-9}$	-0.088	-3.865	-0.823
	[0.581]	[3.763]	[2.140]
Unemployment rate	0.001*	0.002	-0.006***
	[0.001]	[0.004]	[0.002]
Log real per capita income	-0.009		
	[0.034]		
State and year fixed effects?	Yes	Yes	Yes
Region-specific time trend?	Yes	Yes	Yes
Average of all redistribution coefficients	**-0.21***	**-0.57**	**1.26****
	[0.12]	**[1.17]**	**[0.57]**
Observations	867	867	867
R-squared	0.53	0.99	0.99

Note: Robust standard errors, clustered at the state level, in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively. 'Tax Redistribution$_{\delta,t}$' is calculated as $S\dot{G}B_{\delta}$-$S\dot{G}A_{\delta}$ (see text for details).

6. The Political Economy of Taxation and Inequality

Until this point, I have assumed that taxes drive inequality. But might the reverse be true? Discussing the conclusions of Feldstein and Wrobel (1998), Bakija and Slemrod (2004, 56 n5) argue that observing a positive relationship between tax redistribution and inequality of gross hourly wages would also be consistent with a "stabilizing" political economy explanation, under which states with more unequal wage distributions implement more redistributive taxation systems.

It is also possible that politics operates in the opposite direction, and that states with more equal wage distributions tend to implement more redistributive taxation systems. One reason that this might occur is that the average value of public goods to members of a community decreases as heterogeneity increases (Alesina, Baqir and Easterly 1999). Another possibility is that if the rich experience an increase in their incomes, they may channel part of this into campaign contributions to candidates who prefer less redistributive taxation.

One way of testing these two theories is to estimate almost the reverse regression to that presented in equation (11). Instead of looking at the effect of current and lagged taxes on inequality, I now explore whether lagged inequality appears to have any impact on tax redistribution. Of course, it is not possible to test whether inequality in the current period affects tax redistribution in the current period. But inherent in the political economy explanations is some notion of a lag, so this test should be fairly robust.

Table 5 indicates that inequality does affect the redistributive effect that states choose. Averaged over 4 or 9 years, a one standard deviation increase in wage inequality (0.3 Gini points) is associated with an increase in the redistributive effect of taxation in the order of 0.06 to 0.09 Gini points. Redistributive taxes do indeed appear to act as a brake on rising inequality, though the magnitude of the effect is small. Note that this finding does not affect the foregoing result – that redistribution had no discernable effect on pre-tax inequality. However, it does provide some evidence in favor of Bakija and Slemrod's critique of the findings of Feldstein and Wrobel.

Table 5: Political economy – does inequality drive tax redistribution?
Dependent variable: Tax redistribution index

	(1)	(2)	(3)
Pre-tax $Gini_{t-1}$	0.004	0.000	0.001
	[0.003]	[0.002]	[0.001]
Pre-tax $Gini_{t-2}$		0.004*	0.002
		[0.002]	[0.002]
Pre-tax $Gini_{t-3}$		0.004*	0.001
		[0.002]	[0.002]
Pre-tax $Gini_{t-4}$		0.007***	0.003
		[0.003]	[0.002]
Pre-tax $Gini_{t-5}$			0.003*
			[0.002]
Pre-tax $Gini_{t-6}$			0.004*
			[0.002]
Pre-tax $Gini_{t-7}$			0.003
			[0.002]
Pre-tax $Gini_{t-8}$			0.003*
			[0.001]
Pre-tax $Gini_{t-9}$			0.005*
			[0.002]
State and year fixed effects?	Yes	Yes	Yes
Region-specific time trend?	Yes	Yes	Yes
Avg of all Gini coefs		**0.003****	**0.002*****
		[0.001]	**[0.0009]**
Observations	1275	1122	867
R-squared	0.95	0.95	0.96

Note: Robust standard errors, clustered at the state level, in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively. 'Tax Redistribution index' is the negative of the Reynolds-Smolensky index, calculated as $\dot{G}B$-$\dot{G}A$ (see text for details).

7. <u>Conclusion</u>

Using a Gini-based index of tax redistribution for US states over the period 1977-2002, I find little evidence that more redistributive state taxes lead to a more unequal distribution of pre-tax hourly wages. This remains true when alternative measures of redistribution are used, placing more weight on the bottom or on the top of the distribution. This is consistent with the fact that redistributive state taxes do not have a significant impact on interstate population flows.

More redistributive taxation is also associated with a slightly more equal distribution of post-tax hourly wages. However, it is possible that the extra expenditure raised by redistributive taxation might then be used to reduce family income inequality, a hypothesis that is not tested here. There is no strong relationship between tax redistribution and total state personal income. Robustness checks reveal a small but significant political economy effect: a rise in inequality tends to be followed by more redistributive taxes. This does not affect the central finding of this paper, but may help reconcile these results with the existing literature.

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Data Appendix

Inequality

Inequality measures are calculated from the March Current Population Survey (CPS), using Stephen Jenkins' "ineqdeco" Stata routine. Person-weights were used, and hourly wages were not adjusted for family size. Since the CPS asks households about earnings in the previous year, the 1978-2003 surveys provide data on household income from 1977-2002. The sample is further restricted to adults aged 16-55 with positive hours and earnings. Hourly wages are calculated by dividing annual earnings for the previous year by the total number of hours worked in the previous year (calculated by multiplying the number of weeks worked in the previous year by the usual number of hours worked per week in the previous year). To avoid extreme values biasing the calculations, hourly wages below a minimum value are omitted and those above an upper threshold are truncated. In 2002, the minimum value was $1 and the top-code was $500. In earlier years, these figures are indexed to changes in average wages, so for example in 1977, observations with hourly wages below $0.27 were dropped, while the top-code was set at $134.11.

Although the CPS is designed to be representative at a state level, the person-weights that are provided are calculated based on national demographics, rather than state demographics. However, this is unlikely to make a substantial difference. Using the CPS to calculate trends in inequality in California, a state whose demographic composition is very different to the nation as a whole, Reed, Haber and Mameesh (1996, Appendix B) used census data to form new CPS weights for California, and found that it made virtually no difference to their estimates.

Tax redistribution

To calculate redistribution measures, I use a national sample comprising a randomly selected 10 percent of the March 1990 CPS (15,847 individuals). Income is indexed by multiplying each family's income by ($MedEarn_{st}/MedEarn_{1990}$), where $MedEarn_{st}$ is median family income in a given state and year, and $MedEarn_{1990}$ is the median family income across the US in 1990 ($38,640). This ensures that the distribution of earnings remains unchanged, but that incomes are at an appropriate level for the tax brackets in a given state and year.

For example, median family earnings in North Dakota in 1984 were $23,491, so in order to calculate tax redistribution, I take the 15,847 individuals from in the 1990 CPS sample, multiply their incomes by 0.607 ($23,491/$38,640), then assign them the state code for North Dakota, and the year 1984.

Each state-year sample is then fed through the NBER's Taxsim program (Feenberg and Coutts 1993). To simplify calculations, I assume that all family income is wage income, that individuals file as singles, and couples file jointly (with two-thirds of the income assigned to the primary earner). Dependent child exemptions and age exemptions are taken into account. Post-tax income is net of state and federal taxes, but not net of FICA, which is regarded as akin to savings. Taxsim covers all 50 states plus the District of Columbia from 1977-2002. I therefore feed the same sample (with incomes indexed according to the median income in that state and year) through the Taxsim program a total of 1326 times (51*26). The ratio of pre-tax income to post-tax income gives (1-ATR).

To calculate a measure of tax redistribution as it applies to hourly wages, I calculate pre-tax hourly earnings in the same manner as for the state inequality statistics, ie. by dividing annual earnings for the previous year by the total number of hours worked in the previous year. As with the inequality measures, the sample is restricted to those aged 16-55, and the same bottom-coding and top-coding rules are applied to pre-tax hourly earnings. The pre-tax Gini coefficient for all states and years remains constant at 0.36, while the pre-tax S-Ginis are 0.15 (δ=1.25), 0.24 (δ=1.5), 0.43 (δ=2.5), and 0.52 (δ=3.5). Post-tax hourly earnings are then calculated by multiplying pre-tax earnings by (1-ATR). The difference between the Gini/S-Gini of pre-tax hourly earnings and the corresponding Gini/S-Gini for post-tax hourly earnings is the measure of tax redistribution in a given state and year.

Other state variables

Migration rates and hourly wages are calculated from March CPS data, applying the same sample restrictions as used in calculating the inequality measures (sample restricted to adults aged 16-55, hourly wages bottom and top-coded). Since the mobility question was only asked for the income years 1981-84, 1986-94, and 1996-2002, the sample for this specification is somewhat smaller. The migration question asks about mobility since March 1 in the previous year, and thus does not match up perfectly with the calendar year measures used for other statistics. For example, I match migration data from March 2002 to March 2003 with tax redistribution in tax year 2002. Note that the outgoing migration rate is smaller than the incoming migration rate, most likely because some CPS respondents identify as interstate movers, but omit to identify the state from which they moved.

Real personal income and population are from the Bureau of Economic Analysis (http://www.bea.doc.gov/bea/regional/).

Unemployment rates are from the Bureau of Labor Statistics (http://data.bls.gov/).

Summary statistics for all variables are provided in Appendix Table 1.

Appendix Table 1: Summary Statistics			
Variable	**Mean**	**SD**	**N**
Pre-Tax Gini	0.354	0.019	1326
Post-Tax Gini	0.332	0.015	1326
S-Gini (δ=1.25)	0.141	0.010	1326
S-Gini (δ=1.5)	0.235	0.015	1326
S-Gini (δ=2.5)	0.428	0.020	1326
S-Gini (δ=3.5)	0.518	0.021	1326
Redistribution (Gini)	0.025	0.003	1326
Redistribution (S-Gini δ=1.25)	0.012	0.002	1326
Redistribution (S-Gini δ=1.5)	0.018	0.002	1326
Redistribution (S-Gini δ=2.5)	0.027	0.003	1326
Redistribution (S-Gini δ=3.5)	0.027	0.003	1326
Average Tax Rate	0.154	0.031	1326
Unemployment rate	6.059	2.087	1326
Log real state personal income	24.336	1.172	1326
Log real state personal income per capita	9.716	0.435	1326
Incoming migration rate (from interstate)	0.048	0.021	1071
Outgoing migration rate (to another state)	0.036	0.018	1020
Wage ratio: incoming/nonmovers	0.973	0.199	1071
Wage ratio: outgoing/nonmovers	0.982	0.301	1019
Log population (non-institutional)	14.620	1.035	1326