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Insurance Benefits from Progressive Taxes and Transfers*

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Abstract
This paper estimates the total value that individuals derive from their state's tax-and-transfer program, and shows how this value varies by income percentile. The paper decomposes the total value into two components: redistributive value, which is derived from expected taxes and transfers, and insurance value, which occurs when taxes and transfers compensate for unexpected income shocks. The calculations are made using the Panel Study of Income Dynamics and allow for analysis of the determinants of changes in the insurance and redistributive value of state net benefits over a more than 30 year period.

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1. Introduction

State and local governments' role in redistribution during the last few decades has changed in ways that are unexpected given both previous experience and the existing academic research. Standard fiscal federalism models (see early work by Wallace Oates and David Bradford) predict that redistribution should be provided by the federal government. The argument is that the provision of redistribution policies by state and local governments is undermined by the mobility of potential residents. Redistribution at the local level attracts net beneficiaries and leads net payers to move elsewhere.

In recent decades, however, states have increased their involvement in redistribution policies. State income taxes have increased substantially as well as state expenditures on the lower-income population, including state Earned Income Tax Credits. On the transfer side, the gains in state expenditures have primarily taken place in the area of health care—with increases in expenditures on Medicaid and SCHIP.

These facts and theoretical backdrop provide the motivation for this paper. We comprehensively explore the nature of state redistribution policies, and examine reasons for their changes over time. We employ the framework developed in Hoynes and Luttmer (2010) for calculating the total value (i.e., the equivalent variation) that an individual receives from a tax-and-transfer system, and implement it for state tax-and-transfer systems. The framework allows us to decompose this total value into a redistributive component and an insurance component. The redistributive component is due to predictable changes in income (and household circumstances) while the insurance component is due to unpredictable changes in income. Our approach is a forward-looking one, where we examine income and transfers over a 10-year period. Within this approach, we can examine the possibility that these programs do not so much redistribute across people with different levels of expected income as provide insurance against unexpected income shocks within groups of people that have the same expected income. In other words, the insurance component ex-post redistributes (among a group of individuals who ex-ante had the same expected income) from those with high income realizations to those with low income realizations. Such insurance benefits are inherent in unemployment insurance, but are also present in public health insurance programs, welfare programs and the personal income tax.

We examine changes over time in the redistributive and insurance value and decompose those changes into: (i) the component that is due to changes in income and family composition mobility, (ii) the component that is due to changes in residential mobility, and (iii) the component that is due to changes in state tax-and-transfer programs.

Our empirical implementation uses the Panel Study of Income Dynamics. The PSID is ideally suited for this analysis as it provides longitudinal data on a representative sample of families. Further, by spanning more than three decades (1968-2005) we are able to richly explore the determinants of changes in the insurance and redistributive value of state net transfers over time.

The remainder of the paper is as follows. In Section 2 we describe the prior literature and in Section 3 we lay out the methodology for measuring the redistributive and insurance value of transfers and our approach for implementing the decomposition. In Section 4 we describe the data, tax-and-transfer programs, and our empirical implementation. We provide the baseline results in Section 5 and present the decomposition in Section 6. Section 7 concludes.

2. Literature Review

Our work has origins in several different areas. Seminal work by Varian (1980) extends the canonical optimal tax problem to allow for an insurance component to redistributive policies. He shows that if evolutions to income involve a random component, and if there are incomplete markets to insure this risk, then redistributive taxation helps to insure against individual risk. Thus the efficiency consequences of taxation need to be balanced against not only the equity of redistribution but also of the insurance value of redistribution.

A related literature focuses on voting models for redistribution policies. The basic question posed in this literature is why the (relatively) poor majority does not vote for redistributive policies, thereby expropriating funds for their group. Buchanan (1976) originally incorporated insurance versus redistribution in tax-and-transfer systems into voting models. He modeled political support for redistribution policies in a setting where future incomes are uncertain, thus identifying an insurance component to redistribution. Benabou and Ok (2001) developed this idea further by exploring to what extent the *prospect of upward mobility* can affect the optimizing choices of forward looking voters. They find empirical support for their model although the results become weaker when risk aversion is added (and thus an insurance component is introduced). This work and the other related papers in this literature all examine redistribution and insurance components of *central* government policies. Further, the focus is on voting models and understanding the determinants of support for redistribution policies, rather than the empirical measurement and decomposition of the kind we implement here.

In our work, we extend this literature to examine *state* redistributive policies. Of course, the major change in moving from a centralized government setting to the state (and local) level is the potential mobility of individuals. From an individual's perspective, the state policies are only relevant in the future to the extent that the individual remains in the state. Feldstein and Wrobel (1998) show that with costless mobility and full information about opportunities outside the state, inter-state mobility of workers and the consequent adjustment of pre-tax earnings across states undoes states' redistribution policies. The extent of full adjustment of pre-tax earnings depends, of course, on the costs of mobility and so on. Feldstein and Wrobel present empirical results that show that increases in marginal tax rates in the state leads to substantial reductions in pre-tax earnings.

These ideas about identifying the insurance versus redistribution components are not unique to government tax policies. They have been investigated and applied in other areas such as health insurance (Cochrane 1995), employment protection and labor market institutions (Agell 2007), and private annuities (Brown 2003).

Finally, our work is guided by several empirical areas. There is a parallel to the literature on the incidence of taxes, introduced by Pechman (1985) and expanded to a lifetime incidence setting in, for example, Fullerton and Lim Rogers (1993). This literature examines the degree of progressivity of income taxes taking into account realized income paths. This approach has also been applied to estimate the lifetime incidence of (or rate of return in) the Social Security program (Brown et al. 2009, Coronado et al. 2000, Gustman and Steinmeier 2001) and long-run participation in means-tested transfer programs (Bane and Ellwood 1994, Blank and Ruggles 1996). The similarity to our work comes from extension to a multiperiod setting; however there is no attempt to identify the insurance versus redistributive components of these programs. The literature on the consumption smoothing effects of transfer programs (Gruber 1997, 2000) is also motivated by an interest in evaluating the degree of insurance in government transfer programs. Gruber uses variation in generosity of state transfer programs to estimate insurance against job loss (provided by unemployment insurance) and divorce (provided by AFDC/TANF) as measured by the impact on household consumption. However, as with the above literature, it relies fully on realized earnings paths and thus cannot distinguish between the insurance and redistributive aspects of policies.

Our work makes several contributions. First, our methodology provides a more complete decomposition and identification of the insurance and redistributive elements of government policies. Second, we focus on state redistribution policies. Third, we emphasis is on estimating the value of the state redistribution programs and decomposing their sources of change. Fourth, we comprehensively measure all major state redistribution policies including taxes (income taxes, state Earned Income Tax Credit, sales taxes), means tested transfers (AFDC/TANF, Medicaid and SCHIP) and social insurance (unemployment insurance).

3. Methodology

Overview

We start by giving a brief overview of the general methodology as developed in Hoynes and Luttmer (2010) for calculating redistributive and insurance value. In the next subsection, we explain how we implement this methodology for state tax-and-transfer systems.

The starting point of our methodology is the "total value" that an individual receives from a tax-and-transfer system. This total value is defined as the equivalent variation of the tax-and-transfer system relative to a baseline of having no tax-and-transfer system, i.e., in the baseline, each individual pays the same lump-sum tax to finance government consumption, which is held constant. The equivalent variation is forward-looking and it is defined on an annual basis. In particular, the equivalent variation is the amount such that the individual is indifferent between (i) the baseline and receiving the equivalent variation each year and (ii) the existing tax-and-transfer system. Because of data limitations, we will look forward 10 years, rather than forever, when calculating the total value.

To determine between which bundles individuals are indifferent, we assume that individuals have CRRA utility functions, have rational expectations, and only derive utility from consumption. We further assume that individuals consume in each year their income plus the benefits they receive minus the taxes they pay. Henceforth, we will refer to benefits received minus taxes paid as "net benefits." Finally, we assume that individuals take their income and net benefits as exogenous. In other words, we do not incorporate behavioral responses to incentives from the tax-and-transfer system into our framework.

We decompose the total value into an insurance and redistributive component. The redistributive value of a tax-and-transfer system is the equivalent variation of receiving one's *expected* net benefit in each future year relative to the baseline of receiving the population average net benefit in each future year. The redistributive value thus captures the expected benefit of the tax-and-transfer system. The insurance value is the equivalent variation of receiving one's *actual* net benefit in each future year relative to the baseline of receiving one's *expected* net benefit in each future year. In other words, the insurance value captures the value of taxes and transfers in deviation from what the individual expected to receive. The decomposition between insurance value and redistributive value depends crucially on the expectation of future net benefits given the characteristics of the individual. On the one extreme, if future net benefits were perfectly predictable given current information, the insurance value would be zero. On the other extreme, if future net benefits do not depend at all on current information, the redistributive value would be zero because everyone's expected future net benefit would be the same.[1] In other words, the predictable component of net transfers is counted as redistribution and the unpredictable component of net transfers is considered to be insurance. Thus, the distinction between the insurance and redistribution rests completely on the predictability of net transfers.

Because our framework is dynamic, we can distinguish two channels by which the tax-and-transfer system provides value. First, the tax-and-transfer system provides redistribution and insurance *across* people: it redistributes from people with high expected incomes to those with low expected incomes, and it channels insurance payments from people with unexpectedly good income realizations to those with unexpectedly poor income realizations. Second, the tax-and-transfer system provides redistribution and insurance *within* people: it redistributes from a person in periods when that person is expected to have high income to the same person in periods when that person is expected to have low income, and it channels insurance payments from a person in periods with unexpected high income realizations to that same person in periods when that person had unexpectedly low income realizations. Thus, we calculate four components of value from the tax-and-transfer system: across-person redistributive value, across-person insurance value, within-person redistributive value, and within-person insurance value.

[1] This later situation corresponds to the notion of individuals valuing the tax-and-transfer schedule behind the veil of ignorance, where the total value of the tax-and-transfer system is the insurance value.

While it is clear that the across-person components provide value, the within-person components may not always provide value. To an individual with access to perfect capital markets, the time-profile of expected net benefits is irrelevant because this individual can borrow or save to achieve the desired expected consumption profile. Hence, such an individual derives no value at all from the within-person redistributive component. Individuals facing liquidity constraints or individuals facing interest rates that are not equal to their discount rates, however, can derive value from the within-person redistributive component. Nevertheless, in light of the generally well-functioning capital markets in the U.S., we believe that the most credible estimate of the total value of the tax-and-transfer system is formed by excluding the within-person redistributive component. We will refer to the total value minus the within-person redistributive component as the "effective total value." Thus, the effective total value consists of three components: the across-person redistributive component, the across-person insurance component, and the within-person insurance component.

Even individuals with access to perfect capital markets generally derive value from the within-person insurance component. To see this, consider a person who in the first period receives an unexpectedly good income realization and in the second period receives an unexpectedly poor income realization of the same magnitude. Hence, the insurance component for this individual is exclusively within person. If the person knew in period 1 that next period's shock would exactly offset the current period's shock, the person could perfectly smooth consumption by saving 100% of the current period's shock. However, individuals generally do not know whether a current period's shock will be offset or compounded by future shock. Not knowing this, an individual would optimally save only part of the shock, thus not perfectly smoothing consumption. Hence, "buffer stock" saving and borrowing will reduce the value of the within-person insurance component but not eliminate it. Given the unpredictability of future shocks (conditional on current ones), we believe that the most credible estimate of the effective total value of the tax-and-transfer system is formed by including the within-person insurance component.

In principle, a more precise estimate of the within-person insurance value could be obtained by explicitly modeling buffer-stock savings behavior, but we do not build such a model for two reasons. First, we do not have long panel data with comprehensive consumption measures (or savings behavior), so we cannot measure realized consumption dynamics. Second, modeling optimal consumption choices, while not impossible, is relatively complex and not the focus of this paper. Rather than explicitly modeling buffer-stock saving behavior, we implicitly allow for it by our choice of the coefficient of relative risk aversion; to the extent that individuals can smooth actual consumption over time by saving or borrowing they are less averse to fluctuations in disposable income, which is our measure of consumption.

We isolate the across-person value of the tax-and-transfer system by calculating the value of the tax-and-transfer system under the assumption that individuals are (somehow) able to perfectly smooth consumption. We calculate the total value of the tax-and-transfer system under the assumption that individuals do not at all smooth consumption. Finally, the within-person value is found by subtracting the across-person value from the total value.

Implementing this framework for state tax-and-transfer systems generates three, increasingly inclusive, measures of the value to individuals of the tax-and-transfer system in their state of residence. We plot each of these three measures as a function of current income to depict the degree to which state tax-and-transfer programs redistribute and provide insurance value. By only counting the value of the state tax-and-transfer system of the state of residence, we exclude the option value of tax-and-transfer systems in other states to which the individual could move in response to income shocks. This may understate insurance value of state tax-and-transfer systems for individuals in states with minimal tax-and-transfer systems and overstate the insurance value for individuals in states with extensive tax-and-transfer systems.

First, we calculate the "naïve" annual value of the state tax-and-transfer program, which is the individual's net state benefit (=state transfer net of state taxes) in the current year minus the mean net state benefit in the individual's state of residence in that year. This naïve annual measure misses two components of the value of the state tax-and-transfer system, namely the redistribution value over longer horizons and the insurance value.

Second, we calculate the across-person redistributive value (including both current and future years) taking a weighted average of the individual's future and current net state benefits minus the mean weighted average of the future and current net state benefits in the individual's state of residence, where future benefits are weighted by the discount factor and the probability that the individual still resides in that state in the future.

Third, we calculate the effective total value of the state tax-and-transfer program by adding the insurance value of the program to the redistributive value calculated above. A state tax-and-transfer program offers insurance value if future incomes are uncertain, individuals are risk averse, and the net benefits fall with income.

For an individual of a given current income level, the differences across states in the effective total value of the state tax-and-transfer program determine the individual's incentive to relocate. Hence, in order to explain why states' tax-and-transfer programs haven't substantially declined in size, we would need to find that the gradient of total value of the state tax-and-transfer program is relatively flat with respect to current income.

After showing the basic results, we show how the redistributive and insurance value can be decomposed into components that are attributable to different tax-and-transfer programs or to different sources of mobility. These decompositions are formed by running counterfactual scenarios through the basic framework.

Implementation for State Tax-and-Transfer Systems

We now describe how we implement this conceptual framework to measure the redistributive and insurance value of state tax-and-transfer systems.

We assume that individuals derive utility from own consumption according to:

$$U(C_{ist}) = \frac{C_{ist}^{1-\rho}}{1-\rho}, \tag{1}$$

where i indexes individuals, t indexes years, s indexes state of residence, ρ is the coefficient of relative risk aversion. C_{it} denotes real household consumption adjusted for household size using an equivalence scale. Thus, we implicitly assume that resources are shared within households and there are economies of scale for larger households. Henceforth, all individual-level consumption, income, tax, and transfer variables are real and adjusted for household size using an equivalence scale. When calculating the total insurance and redistributive value, we assume that individuals fully consume their disposable income in each year.

Disposable income consists of pre-tax income (Y_{it}), the federal transfer net of federal taxes (F_{it}), and the state transfer net of state taxes (B_{ist}):

$$C_{ist} = Y_{it} + F_{it} + B_{ist}. \tag{2}$$

F_{it} and B_{it} are implicit functions of pre-tax income, the state of residence, the federal and state tax system in year t, and certain household characteristics (e.g., the presence of dependent children). Later, for certain implementations of the insurance value and when we perform decompositions, we will explicitly model B_{it}, but unless otherwise note we simply measure their values in the data. We assume that individuals have a real discount rate of r.

Measuring the size of the benefit that individuals derive from the state's aggregate consumption of goods and services by state, year, and individual income level (e.g. state spending beyond net benefits B) is beyond the scope of this paper. Instead, we present results for three possible alternative assumptions about the distribution of these benefits. First, we assume individuals receive a constant benefit from state consumption no matter the size of the actual consumption by the state, so G_{ist} = constant. Without loss of generality, one can set the constant to zero. Second, we assume that all residents of a state derive a benefit that is equal to the actual state's per capita level of consumption, so G_{ist} = (state per capita consumption)$_{st}$. Third, we assume that state consumption and private consumption are complementary, such that the benefit that an individual derives from state consumption is proportional to her own consumption, which we will proxy by disposable income. So, G_{ist} = (state per capita consumption)$_{st} \times C_{ist} / \bar{C}_{st}$ where $\bar{C}_{st}$ denotes average disposable income in state s in year t. We do not include G_{ist} in our measures of total, redistributive, or insurance value. Instead, we will plot G_{ist} in selected graphs that also plot total, redistributive, or insurance value.

Combined Redistributive and Insurance Value

The total value Z_{ist}^{Total} of a state's tax-and-transfer system depends on the person's conditioning characteristics X_{ist}, because these characteristics are used form the expectation of the person's future income and net benefits as well as their variance and covariance. Define $\mathcal{X}(i,t)$ as the set of individuals who have the same (or very similar) values of the conditioning variables as individual i in year t. The conditioning variables are variables on which the future income distribution and benefit eligibility depend. These variables will typically include state of residence, income bracket, education, age bracket, and family composition. If the set $\mathcal{X}(i,t)$ contains sufficient observations for each individual such that the income and benefit paths of individuals in $\mathcal{X}(i,t)$ accurately depict the uncertainty that individual i faces at time t, then we can proceed by finding the sum of the insurance and redistributive value for individual i from the perspective of year t as the solution for Z_{ist}^{Total} to the following equation:

$$\sum_{j\in\mathcal{X}(i,t)}\sum_{k=0}^{K-1}\Big(U(Y_{j,t+k}+B_{j,s,t+k}+F_{j,t+k})-U(Y_{j,t+k}+\overline{B}_{s,t+k}+F_{j,t+k}+Z_{ist}^{Total})\Big)R_{jt}(t+k)\big(1+r\big)^{-k}=0\,, \quad (3)$$

where $\overline{B}_{st}$ denotes the mean net transfer in state s in year t. K denotes the individual's planning horizon, which we set to 10 years because of data limitations. Net benefits in year $t+k$ are discounted by the discount factor $(1+r)^{-k}$ times the probability the individual still resides in the same state in year $t+k$.[2] Let $R_{it}(t+k)$ denote an indicator function that equals one if individual j resides in period $t+k$ in the same state as this individual inhabited in period t. We need the indicator since we only measure the redistributive value of the tax-and-transfer system of the individual's current state of residence. Next, we calculate the average value of the Z_{ist}^{Total} by income percentile to find the average redistributive and insurance benefit of the state tax-and-transfer system by income percentile. Note that this calculation is *not* equivalent to solving equation (3) by $\mathcal{X}(i,t)$ that are solely defined by income percentile since $U(.)$ is a non-linear function.

We decompose equation (3) into its four components (across-person redistributive, within-person redistributive, across-person insurance, within-person insurance). To calculate the redistributive component, we first need to calculate the expected benefits for each future year for person i conditional on the information set $\mathcal{X}(i,t)$ and conditional on remaining in the current state:

$$\mathrm{E}_{\mathcal{X}(i,t)}[B_{i,s,t+k}\mid R_{it}(t+k)=1]=\sum_{j\in\mathcal{X}(i,t)}B_{j,s,t+k}\Big/\sum_{j\in\mathcal{X}(i,t)}1\,. \quad (4)$$

The total redistributive value is found by solving:

[2] We use a real discount rate of 3%, so we set r =0.03.

$$\sum_{j\in\mathcal{X}(i,t)}\sum_{k=0}^{K-1}\Big(U(Y_{j,t+k}+\mathrm{E}_{\mathcal{X}(i,t)}[B_{s,t+k}]+F_{j,t+k})-$$
$$U(Y_{j,t+k}+\bar{B}_{s,t+k}+F_{j,t+k}+Z_{ist}^{R})\Big)R_{jt}(t+k)\big(1+r\big)^{-k}=0. \tag{5}$$

The total redistributive value is based on the assumption that individuals don't save or borrow. Hence, utility in a year is completely determined by disposable income in that year. This implies that part of the total redistributive value stems from the fact that the tax-and-transfer systems helps smooth the disposable income flow over time *within an individual*. This component of the value would completely disappear if the individual could smooth consumption through other means (or would only derive utility from lifetime income).

To take out the component associated with within-individual redistribution, we recalculate equation (5), but replace all time-indexed variables by the average value over time of that variable for a given individual (using a discounted weighted average for the years that the individual resides in the same state). Let a tilde denote this discounted average, so for any variable $W_{j,t}$ for individual j from the perspective of year t:

$$\tilde{W}_{j,t}\equiv\sum_{k=0}^{K-1}\tilde{W}_{j,t+k}R_{jt}(t+k)\big(1+r\big)^{-k}\Big/\sum_{k=0}^{K-1}R_{jt}(t+k)\big(1+r\big)^{-k} \tag{6}$$

The across-person redistributive value is calculated by solving:

$$\sum_{j\in\mathcal{X}(i,t)}\sum_{k=0}^{K-1}\Big(U(\tilde{Y}_{j,t}+\mathrm{E}_{\mathcal{X}(i,t)}[\tilde{B}_{s,t}]+\tilde{F}_{j,t})-U(\tilde{Y}_{j,t}+\tilde{\bar{B}}_{s,t}+\tilde{F}_{j,t}+Z_{ist}^{R,Across})\Big)\times$$
$$R_{jt}(t+k)\big(1+r\big)^{-k}=0. \tag{7}$$

Because both $\mathrm{E}_{\mathcal{X}(i,t)}[\tilde{B}_{s,t}]$ and $\tilde{\bar{B}}_{s,t}$ are constant for all j in $\mathcal{X}(i,t)$, we can solve (7) explicitly:

$$Z_{ist}^{R,Across}=\mathrm{E}_{\mathcal{X}(i,t)}[\tilde{B}_{s,t}]-\tilde{\bar{B}}_{s,t}\,. \tag{8}$$

Equation (8) shows that the across-person redistributive component does not depend on the curvature of the utility function (i.e., is independent of ρ). This is not surprising because the across-person redistributive component for an individual is equal to the expected present discounted value of the net benefit for that individual from the state tax-and-transfer systems in the state of residence of that individual minus the present discounted value of average net state benefits in that state.

We find the within-person redistributive component as the difference between the total redistributive value and the across-person redistributive component:

$$Z_{ist}^{R,Within} = Z_{ist}^{R} - Z_{ist}^{R,Across} \tag{9}$$

The total insurance value is found by solving:

$$\sum_{j\in\mathcal{X}(i,t)} \sum_{k=0}^{K-1} \Big(U(Y_{j,t+k} + B_{j,s,t+k} + F_{j,t+k}) - U(Y_{j,t+k} + \mathrm{E}_{\mathcal{X}(i,t)}[B_{s,t+k}] + F_{j,t+k} + Z_{ist}^{I}) \Big) \times R_{jt}(t+k)(1+r)^{-k} = 0, \tag{10}$$

and the decomposition into the across-person and within-person components is calculated analogously. In particular, the across-person insurance value is found by solving:

$$\sum_{j\in\mathcal{X}(i,t)} \sum_{k=0}^{K-1} \Big(U(\tilde{Y}_{j,t} + \tilde{B}_{j,s,t} + \tilde{F}_{j,t}) - U(\tilde{Y}_{j,t} + \mathrm{E}_{\mathcal{X}(i,t)}[\tilde{B}_{s,t}] + \tilde{F}_{j,t} + Z_{ist}^{I,Across}) \Big) \times R_{jt}(t+k)(1+r)^{-k} = 0, \tag{11}$$

and the within-person insurance value is found as:

$$Z_{ist}^{I,Within} = Z_{ist}^{I} - Z_{ist}^{I,Across}. \tag{12}$$

The across-person insurance value measures the insurance value of shocks that are not offset by shocks in the opposite direction. It is therefore most responsive to permanent shocks. The within-person insurance value measures the insurance value of shocks that, ultimately, are offset by future shocks (though the individual could not foresee this). It is therefore most responsive to transitory shocks.

Gradients with Respect to Current Income

We plot three measures of the value of the state tax-and-transfer system as a function of percentiles current real income Y_{it}. First, we plot the "Naïve Annual Value," $Z_{ist}^{Naïve}$. For each individual, we calculate the naïve annual value of his state's tax-and-transfer system as:

$$Z_{ist}^{Naïve} = B_{ist} - \bar{B}_{st}, \qquad (13)$$

The naïve value only measures the redistributive value in the current year. It therefore ignores the value that stems from net state benefits in future years or from the insurance value of the state tax-and-transfer system.

Second, we plot the across-person redistributive value, $Z_{ist}^{R,Across}$, by current income percentile. The difference between the plot of $Z_{ist}^{Naïve}$ and the plot of $Z_{ist}^{R,Across}$ shows the importance of expected income mobility. If individuals are expected to retain their position in the income distribution, the plots of $Z_{ist}^{Naïve}$ and $Z_{ist}^{R,Across}$ will be very close, whereas the plot of $Z_{ist}^{R,Across}$ would have a much weaker gradient with respect to current income than the plot of $Z_{ist}^{Naïve}$ if those with current low income expect lower net benefits in the future and those with current high income can expect higher (or less negative) net benefits in the future.

Third, we plot the effective total value, $Z_{ist}^{EffectiveTotal} \equiv Z_{ist}^{R,Across} + Z_{ist}^{I,Across} + Z_{ist}^{I,Within}$, which is the total value minus the within-person redistributive component. The difference between the plot of $Z_{ist}^{EffectiveTotal}$ and the plot of $Z_{ist}^{R,Across}$ shows the insurance value of the state tax-and-transfer system. Since insurance value is never negative, the plot of $Z_{ist}^{EffectiveTotal}$ must lie weakly above the plot of $Z_{ist}^{R,Across}$. The gradient of $Z_{ist}^{EffectiveTotal}$ with respect to income will be less strong than the gradient of $Z_{ist}^{R,Across}$ if higher income individuals derive relatively more insurance value from the state tax-and-transfer system.

Calculating Conditional Expectations

In practice, the sets $\mathcal{X}(i,t)$ will likely contain only one or just a couple of observations if, as would be appropriate, they are conditioned on state, current income, education, age, and family composition. This means that solving the equations in the previous subsection is not feasible by just using realizations of similar individuals to model conditional uncertainty because in practice there are none, or very few, similar individuals in each set of conditioning variables. The reason that these sets are so small is that the conditioning variables have many dimensions. There are two basic potential "solutions" to this dimensionality problem.

First, we could assume that expectations of future income and net benefits are only conditioned on current income bracket. This is a highly restrictive assumption since, in fact, benefits depend significantly on family composition (married/single, number of dependent children) and the state of residence. Moreover, income trends depend on age and education.

Second, we could explicitly model alternative future income realizations (and realizations for family structure, state and so on) for individual i from the perspective of year t. We then would draw time paths for income, family composition, and state of residence from this parametric model and add them to the set $\mathcal{X}(i,t)$ to ensure the set $\mathcal{X}(i,t)$ contains sufficient observations. An additional challenge is that when we draw paths of income, family composition, and state of residence that did not actually occur (e.g. predicted from estimated models), we will also need to predict the associated state and federal net benefit trajectories for those paths. The drawback of creating a model is that it imposes a parametric structure on the paths of income, family composition, and state of residence that may not match the true time-series properties of these variables and interdependencies between these variables. Creating a parametric model of income mobility is challenging because distribution of the income paths is highly dimensional. These paths are characterized by an expected trend (that may vary by initial income, education, state, occupation, age, family composition), the variance of shocks around the trend (that again might vary with all these factors), and the pattern of serial correlation in these shocks (not necessarily just first-order serial correlation). Similarly, the path of family composition is characterized by many dimensions: marital status and number and ages of children (including the birth of additional children). The path of family composition needs to be modeled carefully because AFDC/TANF, Medicaid/SCHIP, and the EITC depend on this.

Finally, the income path and the family composition path are not independent, but subject to correlated shocks.

Hybrid Solution

We propose to solve the dimensionality problem by doing a combination of the two basic solutions outlined above. We use a relatively coarse set of conditioning variables for the possible time-paths of income and family composition (i.e., relying on the first proposed solution). We use a model for residential mobility (i.e., relying on the second proposed solution). We allow the residential mobility process to depend on income realizations, so the model allows for a correlation between income and residential mobility.

We propose that the conditioning set $\mathcal{X}(i,t)$ consists of the observations that are sufficiently similar to the current observation in terms of real income in year t, the "effective-benefit" percentile in year t, and age of the individual. In particular, we use a distance measure, defined in the section on kernel estimation below, to select the observations in information set $\mathcal{X}(i,t)$. We will assume counterfactually that all of the observations in $\mathcal{X}(i,t)$ reside in person i's state of residence in year t. We will therefore replace the actual state benefits of the individuals j in set $\mathcal{X}(i,t)$ by the net benefits they would have received had they resided in person i's state of residence in year t. This yields $B_{j,s,t+k}$ for equation (3). We assume that the federal net benefits (and their income and family composition path) of individuals j are the same as the actual realization that occurred in a different state of residence, so we use the measured values of $Y_{j,t+k}$ and $F_{j,t+k}$ in equation (3). We define the effective benefit percentile from the distribution of net state benefits in year t among all individuals in person i's current income group under the assumption that the benefits of these people are determined according to the rules of the state of residence of person i in year t. By requiring observations in the information set to be similar in terms of effective benefit percentile, we hope to capture much of the information that would otherwise be captured by family composition, education, industry etc. In other words, we hope that the effective benefit percentile can serve as a rough summary statistic for many of variables that ideally would be part of the conditioning set, but that we omitted because of the dimensionality problem.

To model residential mobility, we estimate a probit model of leaving one's state of residence. This mobility model (described more fully below) contains a full set of state dummies, year dummies, and extensive demographic characteristics including polynomials in current income percentile and annual changes in income percentile. We apply this model to predict the probability for each individual in the set $\mathcal{X}(i,t)$ of leaving person *i*'s state of residence in each of the years *t*+1 through *t*+*k*. When calculating the predicted moving probabilities, we assume counterfactually that all the individuals in set $\mathcal{X}(i,t)$ live in year *t* in person *i*'s state of residence and have exactly the same demographic characteristics a person *i*, but we continue to use person *j*'s actual income realization (which we consider a potential income path for person *i*). For each person *j* (who is part of set $\mathcal{X}(i,t)$ in year *t*), we then generate 10 draws of the sequence $R_{jt}(t+k)$ for k=0..10 from that person's predicted mobility rate.[3] We model mobility parametrically because mobility is state-specific and there are too few observations in some states and some years from which to draw realized mobility paths. This problem becomes especially severe if we, in addition, want to condition mobility on any other personal characteristics such as education or income decile.

In this hybrid approach, expectations are conditioned on (i) current income, (ii) state of residence, (iii) effective state net benefit percentile, and (iv) age. To avoid creating conditioning sets that have too few observations, we made two important assumptions. First, we assume that if we condition on narrow ranges of current income, effective state net benefit percentile, and age, then income and federal benefits paths are independent of state of residence. Second, we assume that mobility out of the state of residence is adequately captured by a parametric model.

By using a relatively coarse set of conditioning variables we ensure that the sets $\mathcal{X}(i,t)$ contain sufficient observations. The benefit is that the observation in $\mathcal{X}(i,t)$ are real observations (rather than coming from a model with many structural assumptions), but the drawback is that, in fact, individuals' expectations were probably conditioned on more factors than we assume. It is not possible to determine the direction of bias associated with having the conditioning sets being too coarse; it depends on whether the additional conditioning variables would increase or reduce the absolute value of the conditional covariance between *Y* and *B*(*Y*). Conditioning variables that help predict *Y* for a given family composition would reduce the absolute value of conditional

[3] We need to use draws from probability of leaving the state rather than the actual probability because equations (7) and (11) are nonlinear functions of *R*: *R* enters both directly and through the variables with a tilde. To see why this matters, suppose the probability of leaving the state is 30%. The solution to these equations when we set *R*=0.30 will be different than when we solve the equation with *R*=1 for 30% of observations and *R*=0 for 70% of observations.

covariance and therefore reduce the estimated insurance value. Thus, their omission would lead to an upward bias in the estimated insurance value. However, other conditioning variables could increase the absolute value of the conditional covariance. For example, variables that predict family size (which might both increase Y and $B(Y)$), could increase the absolute value of the conditional covariance, and their omission would lead to a downward bias in the estimated insurance value.

The Insurance Value Against Common Macroeconomic Shocks

As outlined above, the framework classifies the average net benefit received in a future year by individuals in the person's information set as a predicted transfer, which is therefore counted as redistribution. In other words, macroeconomic shocks in a future year that are common to persons in the same information set are not counted in the insurance value. In reality, such shocks are probably largely unpredictable, and therefore should be included when we calculate the insurance value. To avoid treating these common year-specific shocks as predictable, we draw counterfactual income paths from all individuals in the information set (defined over current income, effective benefit percentile, and age) not only from the current year but also from the three preceding years and the three subsequent years. Thus, counterfactual income paths would be drawn from a seven-year window around the individual in question. A macroeconomic shock that hits the individual four years in the future, would hit the individuals from which the counterfactual income paths are drawn anywhere between 1 and 7 years in the future. Hence, it terms of expectations this macroeconomic shock would be smoothed out.

To implement the correction for common shocks, we add to the original PSID sample (described below) six "time-shifted" replications of the PSID sample (corresponding to time shifts of -3, -2, -1, 1, 2, and 3 years). We refer to the resulting sample as the "expanded" sample. To create a time-shifted replication of m years, we take an original observation and shift the time index of each variable (real income, real net federal benefits, family composition) forward by m years.[4] For person i in year t from the *original* sample, we create the set $\mathcal{X}(i,t)$ by taking all observations from the expanded sample that fall within the information set defined over current income, effective benefit percentile, and age. Thus, we calculate the insurance and redistribution value *only* for people from the original sample, but use observations from the expanded sample to create a set of possible paths for the joint time paths of income, family composition, and state of residence. We assume counterfactually that all of the observations in $\mathcal{X}(i,t)$ reside in person i's state of residence in year t. We therefore calculate for all individuals in the expanded sample the net state benefits they would have received had they resided in person i's state of residence in year t. This yields $B_{j,s,t+k}$ for equation (5) for all the individuals j in set $\mathcal{X}(i,t)$. We define the effective benefit percentile from the distribution of net state benefits in year t among all individuals in the expanded sample that are in person i's income group under the assumption that the benefits of these people are determined according to the rules of the state of residence of person i in year t.

Implementing the Conditioning Sets as Kernel Estimators

We implement the conditioning sets in the spirit of kernel estimation. In particular, we the set $\mathcal{X}(i,t)$ such that it consists of observations that are "centered" around observation i. We define the distance of observation j to observation i along three dimensions: percentile in the income distribution, percentile in the effective benefit distribution, and age. Let the distance be given by:

$$d(i,j)=\sqrt{\left(\frac{p_i^{income}-p_j^{income}}{h^{income}/2}\right)^2+\left(\frac{p_i^{benefit}-p_j^{benefit}}{h^{benefit}/2}\right)^2+\left(\frac{age_i-age_j}{h^{age}/2}\right)^2}\,, \tag{14}$$

where p_i^{income} denotes individual i's percentile in the income distribution, $p_i^{benefit}$ denotes individual i's percentile in the effective benefit distribution, age_i denotes individual i's age in years, and h^W denotes the bandwidth for variable W. We select the following bandwidths: h^{income} =10, $h^{benefit}$ =20, and h^{age} =10. The set $\mathcal{X}(i,t)$ is then defined by all observations j in period t (including "time-shifted" observations) such that $d(i,j)\leq 1$. Moreover, when calculating expectations or conditional expectations, we weight the observation j in set $\mathcal{X}(i,t)$ using the Epanechnikov kernel:

[4] We do not recalculate the net federal benefits, so the federal benefits of the time-shifted observation are based on federal tax and benefit rules that where in effect m years ago. We do recalculate all the state benefits to reflect the

$$weight_{j,\mathcal{X}(i,t)} = \max\left\{0, \frac{3}{4}\left(1 - d(i,j)^2\right)\right\}. \tag{15}$$

Decompositions

The framework described above provides measurement of the total value of state tax-and-transfer programs, and the separation of the total value into the redistributive and insurance components. Using this framework, as described more fully below, we empirically estimate the insurance and redistributive values for a representative sample of individuals over a thirty-five year period. We then plot the insurance and redistributive values by percentiles of the income distribution.

Once we have estimates of these "value curves", we can empirically investigate the major determinants of the insurance and redistributive elements of the tax-and-transfer programs. In particular, we examine how the insurance and redistributive value curves vary over time and by policy. The "by policy" analysis allows us to determine the role played by state tax versus state transfer programs and to isolate the impact of particular programs (such as Medicaid) or particular tax provisions (such as the state Earned Income Tax Credit) thus yielding estimates of the marginal value of each program.

After establishing these basic findings, we decompose the changes in value curves over time. In particular, we examine three sources of change in the value curves: (i) the component that is due to changes in income mobility and family composition, (ii) the component that is due to changes in residential mobility, and (iii) the component that is due to changes in the rules of the state tax-and-transfer programs. Each of these components is found by calculating the redistributive and insurance value curves but replacing one of the actual determinants by a

rules in the time-shifted year rather than the rules in the year when the original observation took place.

counterfactual determinant. For example, to calculate component (iii) we would apply draws from the income and family composition mobility from all time periods and use residential mobility from all time periods, but calculate net state benefits according to the rules of the actual time period.

If desired, we can also use this framework to examine how the value curves vary by state (or region) or by demographic group. The analysis by demographic group allows for the investigation of which groups (younger versus older individuals, married versus single, etc) especially gain insurance and redistributive benefits.[5]

4. Data and Empirical Implementation

4.1 PSID Data and Sample

The primary data for this project comes from the Panel Study of Income Dynamics (PSID), a panel data set that began in 1968 with a sample of about 5,000 households. All members (and descendants) of these original survey families were re-interviewed annually through 1997 and bi-annually beginning in 1997. Our data extends to survey year 2005. The original 1968 sample consists of two subsamples: a nationally representative subsample of 3,000 households and a subsample of 1,900 low income and minority households. To adjust for this nonrandom composition, the PSID includes weights designed to eliminate biases attributable to the oversampling of low-income groups and to attrition. All results use the weights provided by the PSID.

The PSID includes data on annual income from earnings, assets, and public and private transfers. The income data refer to the calendar year prior to the survey year, so the "income

[5] It is not clear, however, that the insurance benefits, when calculated as an average for a demographic group, are meaningful when these demographic characteristics were not part of the set of conditioning variables.

years" for the PSID span 1967-2004. Income amounts are collected separately for the head, wife, and (for some years and some types of income) other family members. These can be aggregated to measure total family income. We have worked to construct a comprehensive and consistent income measure, which is challenged by the inevitable changes in the reporting of income over time.[6] In addition to the income variables, the PSID includes measures of family structure and family size, demographics, and state of residence.

The unit of observation in our analysis is the individual. We look at individuals—rather than households or families—because of the significant changes to families that occur over time and over the life cycle (leaving home, marriage, divorce, children, etc). We recognize, however, that many (most) of the tax-and-transfer programs depend on *family* income and *family* characteristics. Our sample, then, consists of longitudinal data on individuals but we attribute to them the income and family composition (e.g. number of children) of their family unit. We therefore treat utility as an individual-level concept but one that depends on household-level income. So, implicitly we assume resources are shared equally within households (and thus construct income and benefit measures using household definitions). However, to account for differences in family size and composition, we adjust all income and transfer amounts using the OECD modified equivalence scale.[7]

Our baseline sample consists of all individuals ages 25-52. Further, we include an observation in the sample *only* if we observe them for the next *K-1* years (so we can construct the forward looking measures of redistribution and insurance value as shown in (5) and (10)). In

[6] Examples of changes over time include some income sources not being available in the early years of the survey (child support, alimony and social security income being in 1970). In addition, in some years income information is provided separately for the head and wife and sometimes they are aggregated into one variable. Meyer, Mok and Sullivan (2009) provide useful reference on this issue.
[7] This scale assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child. See http://www.oecd.org/LongAbstract/0,3425,en_2649_33933_35411112_1_1_1_1,00.html for details.

practice, we choose a 10-year horizon (*K-1*=9). The rationale for excluding those over age 52 is to ensure that by the end of the 10-year window all individuals will be younger than the early retirement age for Social Security (62). Once individuals retire, they face relatively little earnings risk and the programs aimed at them are by and large federal. Finally, we start the sample at age 25 so as to start the process after individuals have completed their schooling and are in the labor force.

We begin by limiting further our baseline sample to include observations from survey years 1973, 1983, and 1993. Recall that in order to minimize the influence of common shocks, our information set for an observation in year *t* includes individuals from years three years prior to *t* and three years after *t*. Therefore, given the 9-year look-forward and the 3-year time shifting to smooth the common shocks, the sample from 1993 will use data through 2005, the last year in the data. By using these three years (1973, 1983, 1993), we are able to apply our methodology to the full PSID period and examine how the insurance and redistributive values have changed over time.[8]

4.2 Measurement of Income and Consumption

We use the PSID to construct our key variables: total family (pre-tax and transfer) income (*Y*), state transfers net of state taxes (*B*), and federal transfers net of federal taxes (*F*). Table 1 lists the components of each of these variables. Total family income consists of earnings, asset income, child support and alimony, and private transfers. *F* includes federal transfers (Social Security, Supplemental Security Income, and Food Stamps) less federal taxes (personal income taxes including federal EITC and payroll/FICA taxes). *B* includes state transfers (AFDC/TANF, Unemployment Insurance, Worker's Compensation, General Assistance, Medicaid, and SCHIP) less state taxes (personal income taxes including state EITCs and sales taxes).[9]

To construct annual measures of income and transfers, we linearly interpolate between sample observations when the survey becomes bi-annual beginning in 1997.[10] We linearly interpolate realized values for income, taxes, and benefits for the missing years. Note, that we interpolate the B (and F) rather than calculate B for the interpolated values of Y. This creates a discrepancy if B is a *nonlinear* function of Y. On the other hand, B also depends on household composition and other factors that we cannot model well. We therefore feel that this discrepancy is minor relative to the estimation error involved in calculating B for the interpolated value of Y.

4.3 Tax-and-Transfer Calculators

Our analysis makes use of realized as well as calculated tax-and-transfer benefits. First, for all baseline calculations and decompositions, we use *realized* values for federal benefits net of taxes (F). That is, the aim of the paper is to measure the insurance, redistributive, and total value of *state* tax-and-transfer programs.[11] As such, we include and measure F only to fully capture the family's total post-tax and transfer income. Therefore, the framework outlined above does not require any counterfactual calculations for federal tax-and-transfer payments and hence our reliance on realized values for F throughout. The federal transfers measured in the PSID include Social Security, SSI, and Food Stamps. Federal taxes paid, however, are not in the PSID. We use the NBER TAXSIM tax model to calculate personal income and FICA taxes.

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[8] In future versions of the paper, we may expand the baseline sample to include all observations from 1973-1993.
[9] This covers the major state redistributive transfer programs with the exception of housing benefits.
[10] There are also a small number of observations that are missing from the survey one year and then return. We apply the same method to those missing values.
[11] See Hoynes and Luttmer (2010) for an analysis of the insurance and redistributive value of *federal* tax-and-transfer programs.

For state tax-and-transfer variables, we need not only the realized values but also the ability to calculate the benefits *B* under many counterfactual scenarios. For example, to calculate the baseline insurance and redistributive values, we make use of an *information set* defined as observations that are "similar" to the given observation based on income percentile, net benefit percentile and age (as in equation 3). To implement this approach requires calculating benefits for each member of the information set under the rules in the state-year of the given observation. Specifically, we model three state transfer programs (AFDC/TANF, UI, Medicaid/SCHIP), state personal income taxes, and state sales taxes. Because of their complexity and relatively minor role, we do not model general assistance or worker's compensation.

The modeling of Medicaid and SCHIP raises challenges—for example the need to empirically measure the income-equivalent value of the benefits—but it is important to include it in our project. Public health insurance matters in determining the insurance value of transfers in direct and indirect ways. First, the expansion of state public health insurance provides an increase in the safety net and directly affects our calculations of the insurance value of transfers. Second, increases in health costs and/or reductions in employer provided health insurance can lead to increases in the costs of a negative earnings shock. This increases the insurance value of public health insurance (even without any expansion in the program).

Table 1 summarizes the income components and the federal and state tax-and-transfer benefits that we include in the analysis. The top panel lists the elements that are reported in the PSID (and therefore we can measure realized values) and the bottom panel lists the elements that we have to simulate for all households. In addition, we present in bold each of the tax-and-transfer programs that we model as part of this project.

The state tax-and-transfer calculators are described more fully in the appendix. But here we discuss each briefly:

- AFDC/TANF: Prior to welfare reform in the 1990s, we assign AFDC eligibility and benefits using maximum benefits by state, year and family size and (non state varying) benefit reduction rates. We limit benefits to female-headed households. Welfare reform (beginning with welfare waivers and ultimately with conversion to TANF) led to many changes in state aid; our eligibility and benefits are calculated to account for the income disregard rules in each state-year.

- Unemployment Insurance: UI eligibility and benefits are simulated using earnings in the prior year and the rules in place for that state-year. This calculator is based on Gruber (1997), updated by Chetty (2008), and generously shared with us by these authors.

- Medicaid/SCHIP: We account for eligibility for state public health insurance as part of categorical eligibility (if eligible for AFDC/TANF then eligible for Medicaid), as well as the expansions in coverage for pregnant women and children beginning in the late 1980s. Thus using family income, family size, children's age, and presence of an infant child in the next year (proxy for pregnant woman), we assign eligibility using the rules in place in each state-year. Conditional on eligibility, we assign the income-equivalent benefit using average Medicaid/SCHIP expenditure per recipient in the state-year. The Medicaid/SCHIP calculator was originally constructed by Currie and Gruber (1996, 1997), updated by Doug Miller and Peter Huckfeldt and generously shared by these authors.[12]

- State Personal Income Taxes: As with federal taxes, we use the NBER TAXSIM model to calculate state personal income taxes. However, TAXSIM's state income tax calculator extends only back to 1977. Jon Bakija generously provided us with his state tax calculator (Bakija 2009), which we use for years prior to 1977.

- State Sales Taxes: Sales taxes are calculated by applying state-year varying sales tax rates to estimated family taxable expenditures. Family taxable expenditures are estimated by multiplying family income by the ratio of taxable expenditure to income. This ratio is calculated by year and income quintile using the CEX.

Not all eligible families receive public transfers. Indeed, take-up rates range widely across programs (Currie, 2003). This is not an issue to the extent we use realized values of components of *B* (and *F*). For calculated state transfers and the state and federal EITC, however, we apply

[12] In future work, we may include a measure of out-of-pocket health costs. This would be used to capture, in the absence of eligibility for public health insurance, the expected costs for health care. The out-of-pocket medical expenses could vary by earnings decile and year and measured using the CEX or MEPS data.

take-up rates from the literature. We simply multiply imputed benefits by the relevant take-up rates. For more information on this adjustment, see the appendix.

4.4 Estimating Moving Probabilities

As describe above, to calculate conditional expectations we adopt a hybrid approach where we use realized income paths for individuals within the same information set combined with a parametric geographic mobility model. We need estimates of $R_{jt}(t+k)$ which equals one if individual j resides in period $t+k$ in the same state as this individual inhabited in period t.

To do so, we estimate a probit model on the baseline sample described above. There are nine observations for each observation in our baseline sample described above (individuals 25-52 in 1973, 1983, or 1993). The nine observations correspond to the 9-year forward-looking period (which combined with the base period creates a 10-year window). We allow the moving probabilities to depend on variables as of the base period (variables for which changes are not predictable or that don't change such as demographics) as well as the path of future incomes (moving probabilities may depend on income realizations).[13] The explanatory variables that take on the value of the starting year of the base period include: dummies for state, race, gender × marital status, gender × spousal educational attainment, and gender × marital status × linear years since base year t. Explanatory variables that vary by year include dummies for calendar year, gender × own educational attainment, family size, number of children (0,1,2+ in each of the following three age ranges: 0-5, 6-12, 13-18), and a cubic in equivalent income percentile, a quadratic in change in equivalent income percentile, and a quadratic in age.

[13] Once a person has moved, we remove the person from the sample for the remainder of the look-forward period, so the probit probabilities are hazard rates of moving (i.e. probability of moving given that the person hasn't moved yet).

When calculating the predicted hazard rates, we assume counterfactually that all the individuals in information set $\mathcal{X}(i,t)$ live in year t in person i's state of residence and have exactly the same demographic characteristics a person i, but we continue to use person j's actual income realization (which we consider a potential income path for person i). For each person j (who is part of set $\mathcal{X}(i,t)$ in year t), we then generate 10 draws of the sequence $R_{jt}(t+k)$ for k=0,..9 from that person's predicted hazard rates.

5. Baseline Results

We begin by presenting results for income and tax-and-transfer benefits using our PSID sample. All of the transfer amounts are realized values (i.e., as reported in the PSID) and includes all items in the top panel of Table 1. We also have calculations of state and federal taxes using TAXSIM. Each observation is assigned the income (or tax or benefits) of the household in which they live. Unless otherwise stated, the household income/benefits are adjusted to per person amounts using the equivalence scale. Values are in 2005$ and all means are weighted using the PSID sample weights.

First, we provide a few descriptive figures on state tax-and-transfer benefits B and, for comparison, the federal counterpart F. Figure 1 plots average state transfers over the sample period. The state transfer is decomposed into the tax component (negative) and transfer component (positive). The total state transfer is the sum of the two and is also shown. For these calculations we include all individuals ages 25-62 and income years 1967-2004. This sample is somewhat broader than what we described above, but we use it here to illustrate the basic patterns in some key variables over time. The state benefits here are averages of the total household values and are not adjusted for family size. Figure 1 shows that state transfers are highly cyclical with peaks in the recession years of 1982 and 1992. State taxes are increasing significantly over this time period. Finally, average state net of tax transfers are negative (taxes>transfers). In Figure 2, we provide similar trends for the federal tax and transfers. Federal taxes include both personal income tax and FICA. The figure shows that federal transfers are very small compared to taxes and, like state taxes, federal taxes are increasing over time.

In Figure 3, we present means of the naïve annual value ($Z^{Naïve}$) defined in equation (13). We calculate means by percentile of the distribution of family income *Y*. In particular, we take means by 5-percentile bins. In this and the remaining calculations, both *Y* and *Z* are adjusted for family size using equivalence scales. There are three lines in Figure 3, one for state taxes, one for state transfers and one for the total. Recall from (13) that the naïve annual value *Z* is equal to the individual's benefit less the mean for that state-year cell. The figure shows that there is significant redistribution in the state tax-and-transfer programs. As expected, transfers largely accrue to the bottom of the distribution while at the top of the income distribution pays high net taxes. Figure 4 shows the mean of the naïve annual value (net of tax and transfer) across four time periods: 1967-76, 1977-86, 1987-96, and 1997-04. This shows an increase in tax payments at the top of the income distribution, although a reduction in redistribution at the bottom. (Note this is incomplete at this point and does not include Medicaid/SCHIP.)

Figures 5-7 compare naïve annual value ($Z^{Naïve}$ defined in equation 13) to the across-person redistributive value ($Z^{R,Across}$ defined in equation 8). The across-person redistributive value uses the 10-year look forward and calculates annualized benefits over this period for all years the individual resides in the state. For these figures, we limit the sample to those 25-52 in years 1967-1996 (as described above in the data section). As expected, the forward-looking across-person redistributive benefit is less redistributive than the single period measure;

however, they do not differ substantially.

To explore the sources for differences between the naïve and across-person redistributive values, Figures 6 and 7 examine the degree of economic and geographic mobility in our PSID sample. In particular, Figure 6 presents sample-average predictions of the probit moving model comparing 1968, 1978, 1988 and 1995. For each of these base years, we show the share still living in the state from 1 to 9 years after the base year. The figure shows that mobility increased between 1968 and 1988, and decreased after 1988.[14] Figure 7 presents average sample transition probabilities between income percentile (equivalence scale adjusted) in year *t* and and year *t*+9 for years 1968 and 1995. The figure shows that the sample exhibits mean reversion although this economic mobility has not changed dramatically over this period.[15]

Returning to the naïve versus across-person redistributive value, Figures 8 and 9 show the same calculations, where we separate out state taxes and transfers. The differences between the naïve measure and the across-person redistributive measure are more substantial for transfers and there is little difference between them for the measures using taxes.

Additional results will be added in next version of the paper.

6. Decompositions

To be added.

7. Conclusions

To be added.

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[14] Our use of these particular years may be obscuring what is a larger trend toward less mobility (Saks and Wozniak 2009).

[15] This is consistent with the comprehensive analysis of Kopczuk et al. (2010) who use a long panel of SSA data and find that earnings mobility increased steadily through the late 1970s, then stabilized.

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Appendix: Details of Transfer Calculators

[To be added.]

AFDC/TANF

Unemployment Insurance

Medicaid/SCHIP

Sales Tax Calculator

State and Local Government Expenditures

What to provide here:
- Sources for the data items
- assumptions made in calculating eligibility or benefits

Table 1
Components of Family Income, Federal & State Tax and Transfers

	Total Family Income (Y)	Federal Tax and Transfer Payments (F)	State Tax and Transfer payments (B)
Measured in the PSID	Labor Earnings	Social Security	**AFDC/TANF**
	Child Support & Alimony	Supplemental Security Inc.	**Unemployment Insurance**
	Income from Assets	Food Stamps	General Assistance & Other
	Lumpsum Payments from insurance or inheritance		Worker's Compensation
	Private transfers from relatives		
	Other private transfers		
Calculated using tax and transfer calculators		**(−) Federal Tax Liability**	**(−) State Tax Liability**
		(−) FICA Liability	**(−) State Sales Tax**
			Medicaid (value of)
			SCHIP (value of)

Figure 1

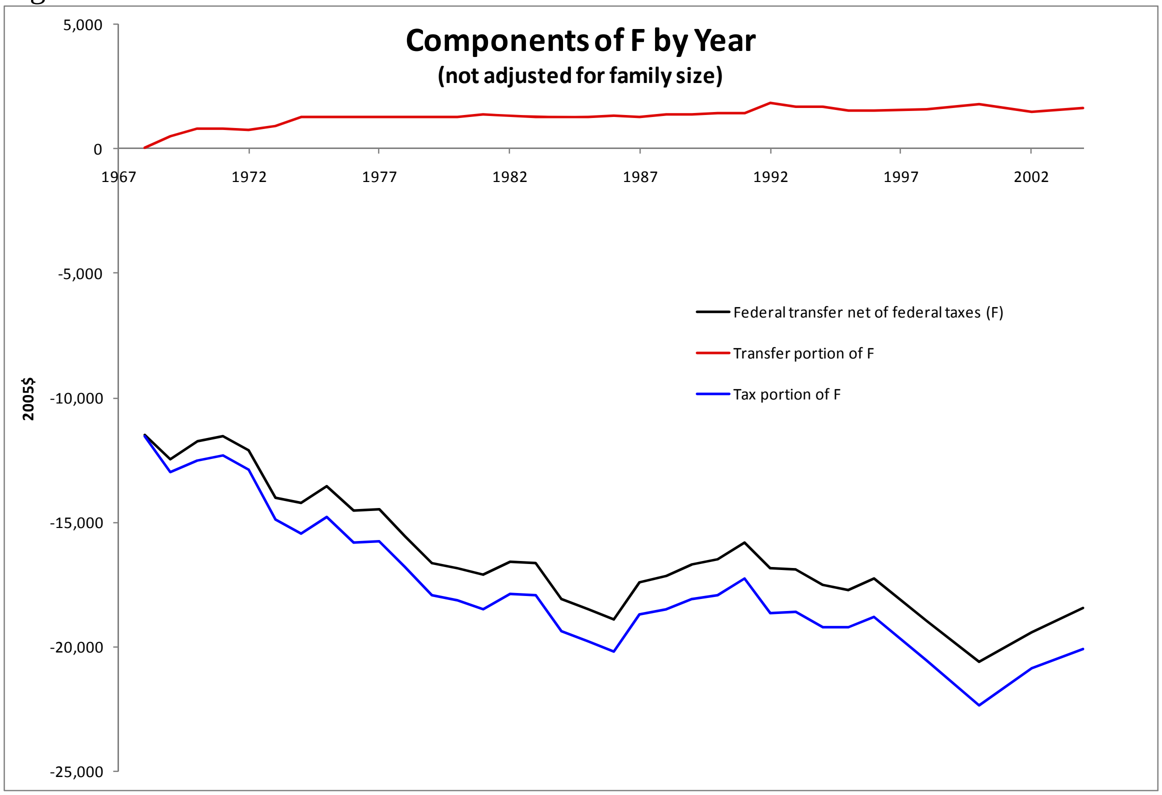


Figure 2

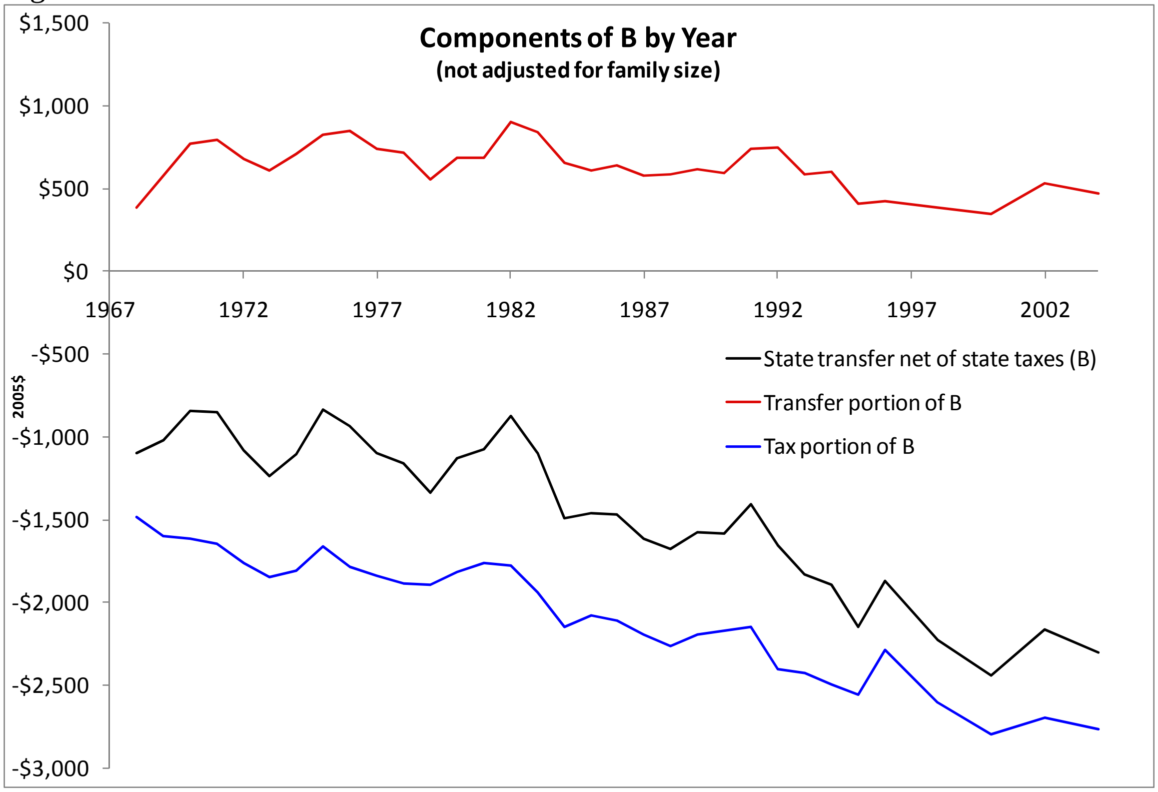
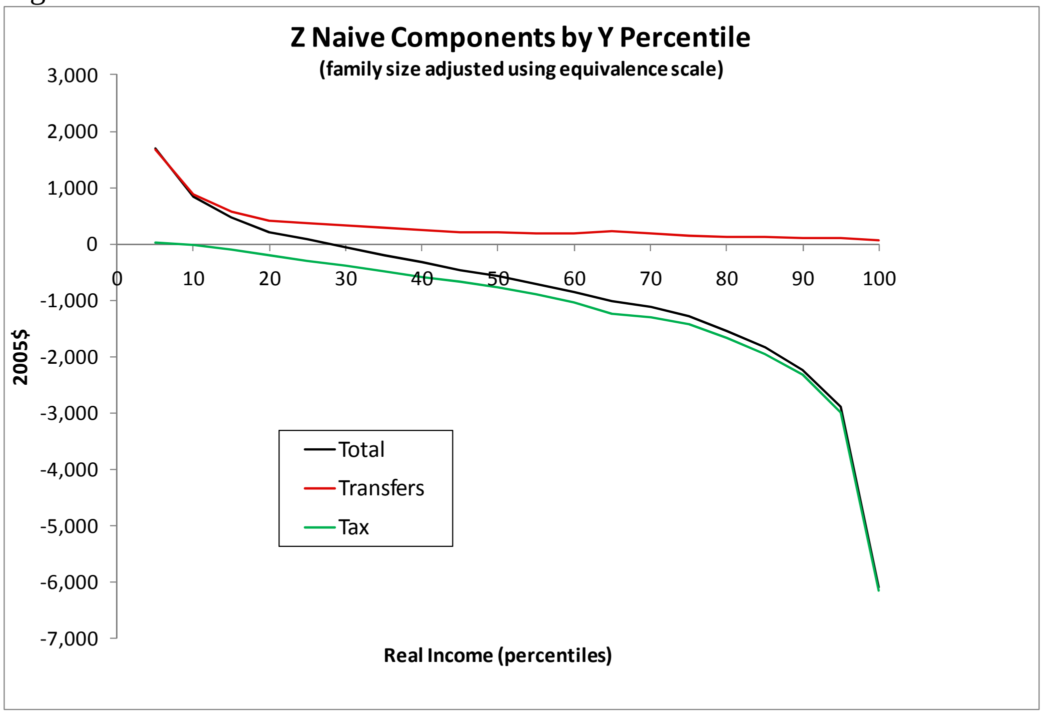


Figure 3



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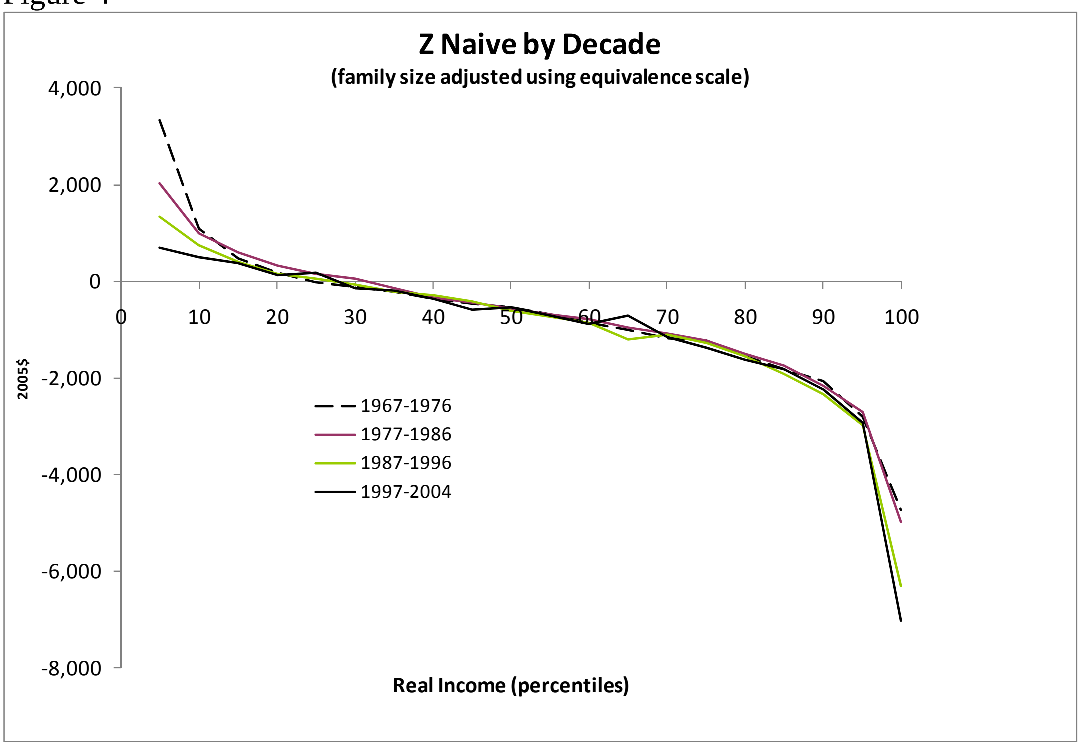

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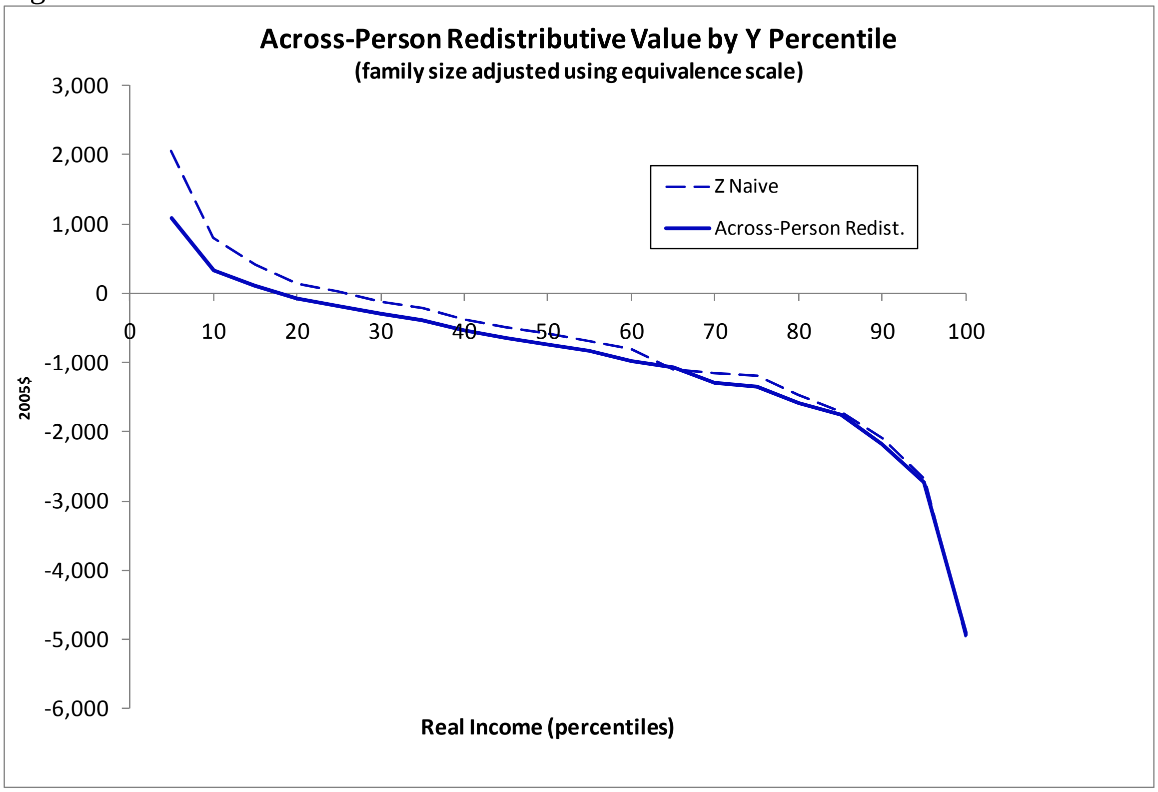
Across-Person Redistributive Value by Y Percentile
(family size adjusted using equivalence scale)
3,000
2,000
1,000
0
-1,000
-2,000
-3,000
-4,000
-5,000
-6,000
2005$
0
10
20
30
40
50
60
70
80
90
100
Z Naive
Across-Person Redist.
Real Income (percentiles)

Figure 6: Predictions of Probit Moving Model, by Year

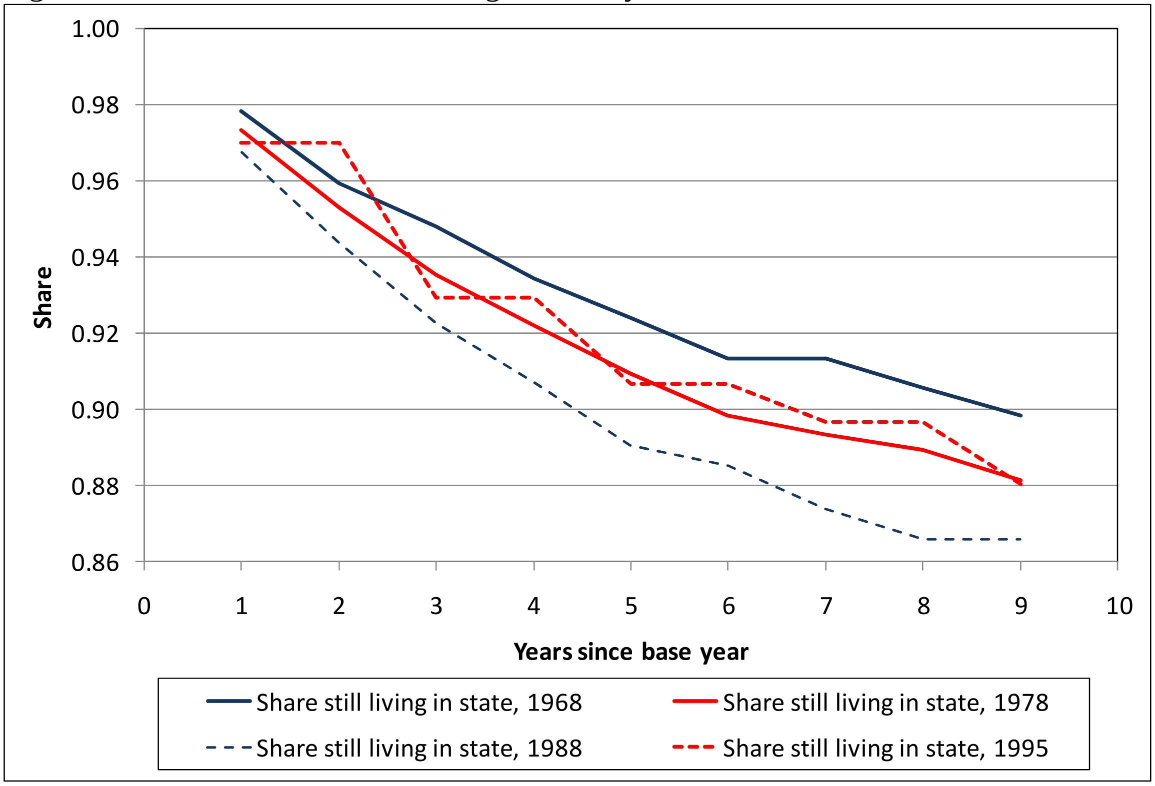

Figure 7: Empirical Transition Probabilities, by Income Percentile and Year

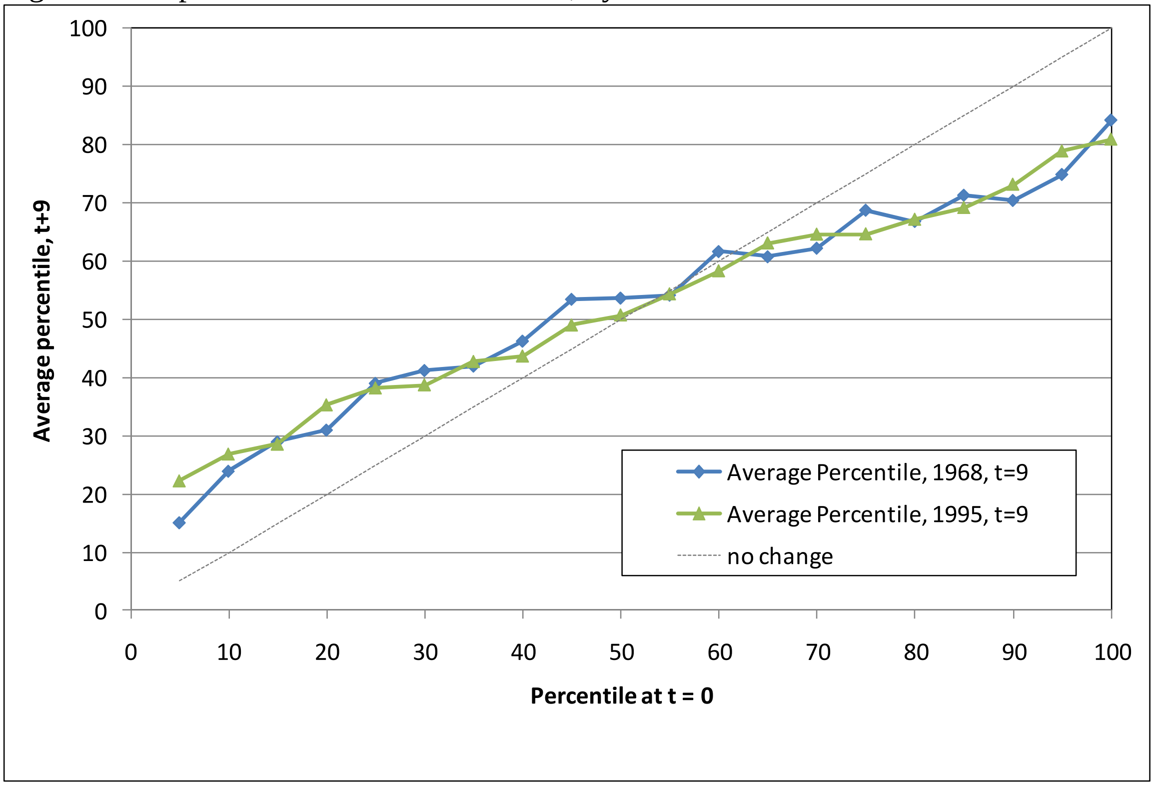

Figure 8

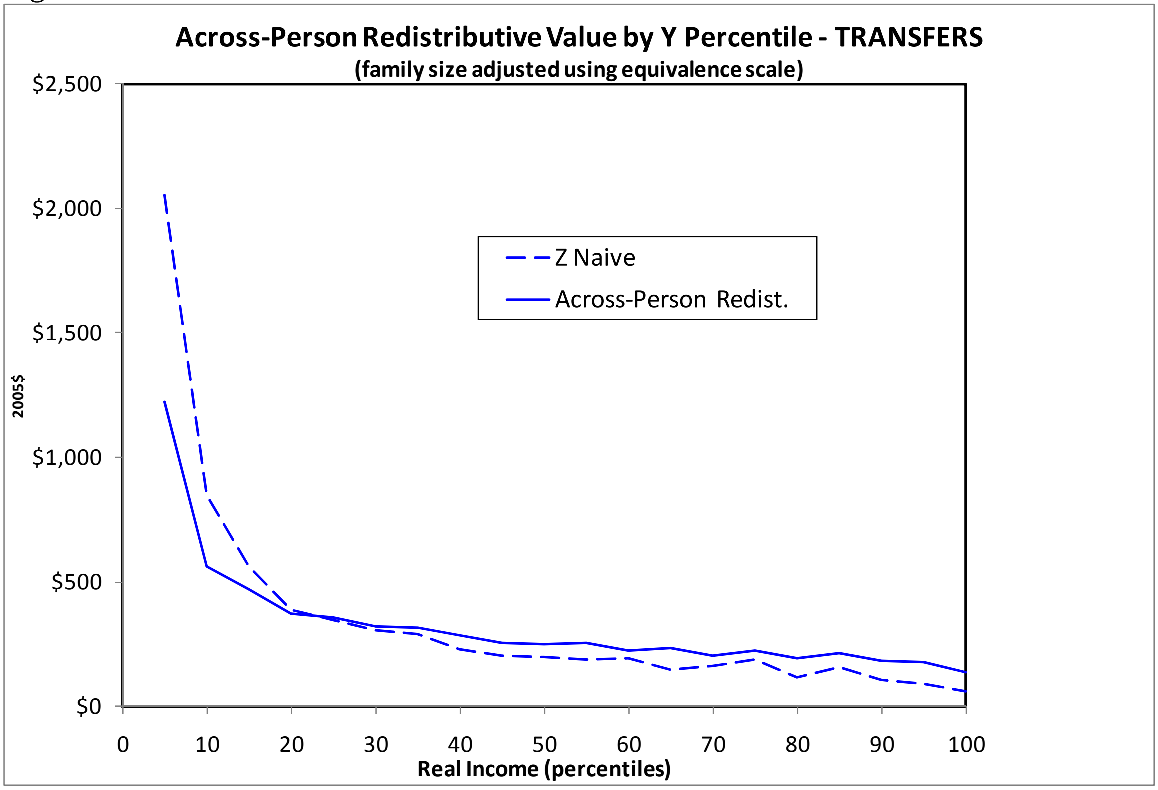

Figure 9