Public Insurance in Fiscal Federations: Evidence from the USA

Johannes Fleck and Chima Simpson-Bell
European University Institute

July 28, 2018

Abstract

In the division of fiscal responsibilities between central and local governments, it is usually argued that income insurance and inequality should be dealt with by the central government. This paper explores the extent to which the US federal tax and transfer system is able to provide uniform social insurance to a prototype family in different states, given variations in state tax and transfer policies. We simulate the combined response of federal and state taxes and transfers to a negative pre-tax income shock, and compare the results for different states. We find large differences in the level of insurance experienced by households in different states, particularly for low income households, and that these differences are mostly driven by state policies.

*Correspondence: Fleck: johannes.fleck@eui.eu, Simpson-Bell: chima.simpson-bell@eui.eu. We would like to thank Árpád Ábrahám, Jérôme Adda, Manuel Arellano, Juan Dolado, Axelle Ferrière, Ramon Marimon, Gaston Navarro and Dominik Sachs for useful comments and suggestions. We would also like to thank participants of the June 2017 ADEMU Summer School in Toulouse, the April 2018 workshop on Risk Sharing and Macroeconomic Interdependencies hosted by CERGE-EI and the May 2018 ADEMU Final conference hosted by the EUI, the 2018 ZEW Local Finance conference, as well as members of the EUI Macro Working Group for comments on an earlier version of this project. We are very grateful to Hilary Hoynes and Erzo Luttmer for generously sharing their calculators for Medicaid and AFDC/TANF benefits.

1 Introduction

It has long been regarded as a basic principle of fiscal federalism that public insurance and income redistribution are best implemented by higher levels of government (Oates (1999); Boadway and Tremblay (2012)). The arguments in favour of this position mostly concern limitations in the ability of lower levels of government to raise revenue, due to differences in tax bases and the budgetary impact of tax base mobility. In contrast, lower levels of government may have better information on local conditions and the preferences of local residents. More recently, this kind of reasoning has partly motivated calls for the European Union to develop a union-level fiscal capacity. In this paper, we re-examine the division of fiscal responsibilities in the context of the US federal system, using a simulation of the federal and state tax and transfer systems.

COULD ADD HERE: Why central government should redistribute: support for the poor is a national good (Ladd and Doolittle, 1982) ; adverse sorting of individuals (Brown and Oates 1987). One view: Some sharing of the distribution function. King (1984) "A basic national redistribution policy, and that subcentral authorities should be allowed to alter the degree of distribution in their areas within specified limits"
The United States is often put forward as a benchmark of fiscal federalism that combines a strong federal authority with highly independent state governments. However, we note several important departures from the theoretical ideal of a fiscal federation which may restrict the ability of a central government to achieve its objectives. Instead of the pure division of policy responsibilities, we see that in some cases state governments engage in extensive redistribution (as noted in Gordon and Cullen (2012)). In addition, it may also be a realistic constraint on some key central government functions that they cannot vary to accommodate differences in local conditions so that, for example, the federal (nominal) income tax schedule cannot vary across states despite different living costs.[1] The United States federal government may therefore face considerable limitations as it attempts to re-allocate income between different types of household.

If the federal government is concerned with the welfare of households regardless of their location, we should expect to see equal treatment of equivalent households in different locations under the tax and transfer system, once local policies are taken into account. Stated differently, state policies may differ due to differences in resources and fiscal constraints, but optimal federal policies should be designed to counteract these differences (Gordon and Cullen (2012))[2]. Furthermore, if agents' preferences exhibit constant relative risk aversion (or elasticity of substitution) we should expect that agents at different income levels have similar exposure to proportional income changes.

This paper presents evidence that this intuition fails for the United States federal system, finding instead that there is considerable variation between households living in different states in the response of disposable income to pre-tax earnings shocks, and within states for different income levels. We find this by simulating the response of the combined tax and

[1] Moretti (2013) provides evidence that differences in the cost of living can be important for evaluating the welfare implications of nominal wage differences.

[2] It is possible that state programs will differ due to preferences for redistribution or risk tolerance. We choose not to explore this avenue in detail but note the lack of clear evidence in support of this argument (see, for example, Alesina and Ferrara (2005))

transfer system to a negative household earnings shock in different states. The variation partly reflects unintended redistributions resulting from local living cost differences, as a result of which households in expensive states lose out. We develop an intuitive measure of the responsiveness of disposable income to pre-tax income shocks and compute this measure for different states and income levels.

Our results are surprising for several reasons. There are large differences in the per-capita income levels of states, which impact state tax revenues and demand for welfare programs; targeted federal grants, however, are designed to mitigate these differences. We might expect that the redistribution motive *within* states and federal assistance would push towards more uniform support for the poor. Federal grants to states for Medicaid, for instance, are significantly more generous for poor states than they are for rich states[3]; other things equal, we would expect a more munificent provision of income support in states where more poor households are located. Nevertheless, we find that an earnings shock to a poor household triggers a much weaker transfer response if the household is located in Mississippi, a poor state, than if it is located in Massachusetts, a rich state.

ADD HERE: Xavier Sala-i-Martin, Jeffrey Sachs (1991) find that "We find that a one dollar reduction in a region's per capita personal income triggers a decrease in federal taxes of about 34 cents and an increase in federal transfers of about 6 cents. Hence, the final reduction in disposable per capita income is on the order of 60 cents. That is, between one third and one half of the initial shock is absorbed by the federal government. The much larger reaction of taxes than transfers to these regional imbalances reflects the fact that the main mechanism at work is the federal income tax system which in turn means that the stabilization process is automatic rather than specifically designed each time there is a cyclical movement in income."
Our paper complements the existing empirical literature on risk sharing and redistribution between US states which considers changes income at the state level. Von Hagen (1992) finds that the US federal fiscal system provides little insurance against shocks to state income. Asdrubali et al. (1996) decompose the sources of risk sharing between states into private and public insurance; while they find that the federal government does play a role in smoothing gross state product, much more insurance is provided by capital and credit markets. More recently, Rodden and Wibbels (2010) include the United States in a panel of seven federations for which they find that central government grants contribute to rather than alleviating the procyclicality of subnational government funds. We differ from this literature by formulating the objective of the federal government in terms of household welfare as opposed to state budgets, and therefore conducting the empirical analysis at the household level. This allows us to separate the effects of state policy from income flows from the federal government which result from differences in state income distributions.

The closest paper to ours is Hoynes and Luttmer (2011), which evaluates the welfare impact of state tax and transfer programs. In their paper, the value of the system is decomposed into a redistributive value, derived from the response to predictable income changes, and the insurance value, which responds to unexpected shocks. We answer a different question

[3]The amount of Medicaid grants to states is determined by the federal medical assistance percentage (FMAP), which stipulates the percentage of a dollar of state spending on Medicaid which will be matched by the federal government. FMAP rates are a function of state per capita income relative to the US average, and vary from a legislated floor of 50% to a maximum of 83%

in that we consider the possibility that state policies may be partly be designed to address limitations in federal policies. We therefore simulate the combined federal-state system. Our simulation methodology also represents a novel approach to overcoming the limited state level data combining household observations on income, consumption and net transfers.

ADD HERE: Methodologically, our work is related to Beraja, Hurst and Ospina (2016). As in their paper, we take price differences across US states seriously and construct an innovative measure to capture respective differentials. Unlike their measure, ours is tailored to the characteristics of the household we study. Moreover, it goes back much further in time. Finally, it captures a much larger share of common household expenditures.
ADD HERE: We also check if there is a relationship between party affiliation of state government and Congress majority or White House. "strategic partisan transfers hypothesis". See Bugarin and Marciniuk 2017 for evidence from Brazil. US?
The rest of the paper is organized as follows. In section 2 we clarify the available channels of social insurance by outlining the main features of the US federal fiscal system, in particular highlighting evidence on the variation in state level resources and welfare policies. In section 3 we describe the simulation which we perform to capture the responses of federal and state net transfer systems to changes in pre-tax income. In section 4 we present the results of this exercise. Section 5 contains concluding comments.

2 The United States Federal System

In the United States fiscal system, both federal and state governments raise revenue through taxes on income, consumption and property, although the composition of taxes varies widely. Welfare programs to targeted groups of households are provided through several funding systems:

- Direct transfers from the federal government to households financed from federal revenues
- Direct transfers from state governments to households financed from state revenues
- Transfer programs implemented and administered at the state level, using grants provided by the federal government

There are also programs which use a mixture of funding sources, such as Medicaid, which is co-financed by state and federal revenues. We summarize the basic flows in Figure 1.

Both the needs and the resources of the states differ because of variations in state income distributions. Figure 2 indicates the extent to which the need for income support may vary between states, showing the proportion of households in poverty as defined by the federal poverty line in 1960 and 2010[4]; the overall incidence of poverty decreased considerably over this period, but it is still roughly twice as high in Mississippi than in a richer state like Maryland or New Hampshire. Sommeiller and Price (2014) document the variation in the prevalence of very rich taxpayers in different states; for example, the average income of the

[4]The federal poverty line is a benchmark household income level used by the US government to determine eligibility for federal aid. It does not vary between states.

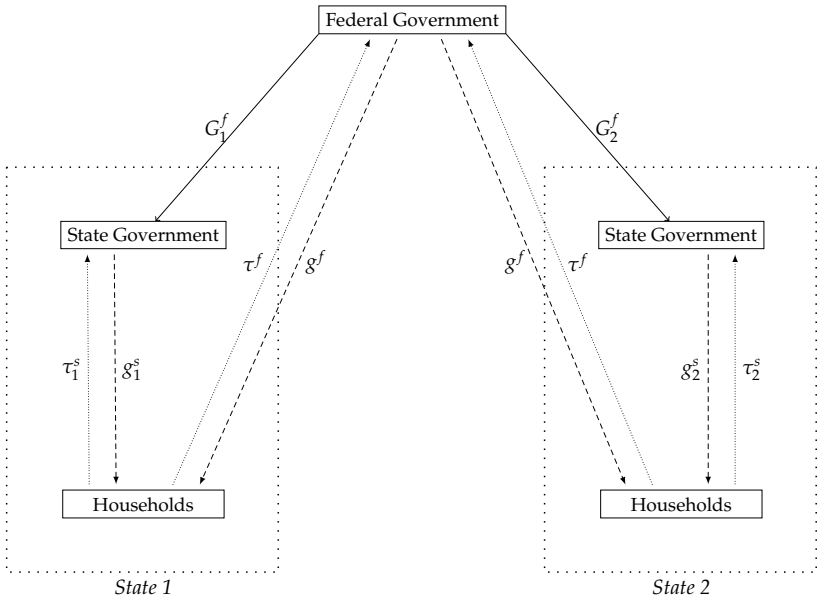

Figure 1: US fiscal funding flows. τ refers to taxes, g to transfers, and G to intergovernmental grants

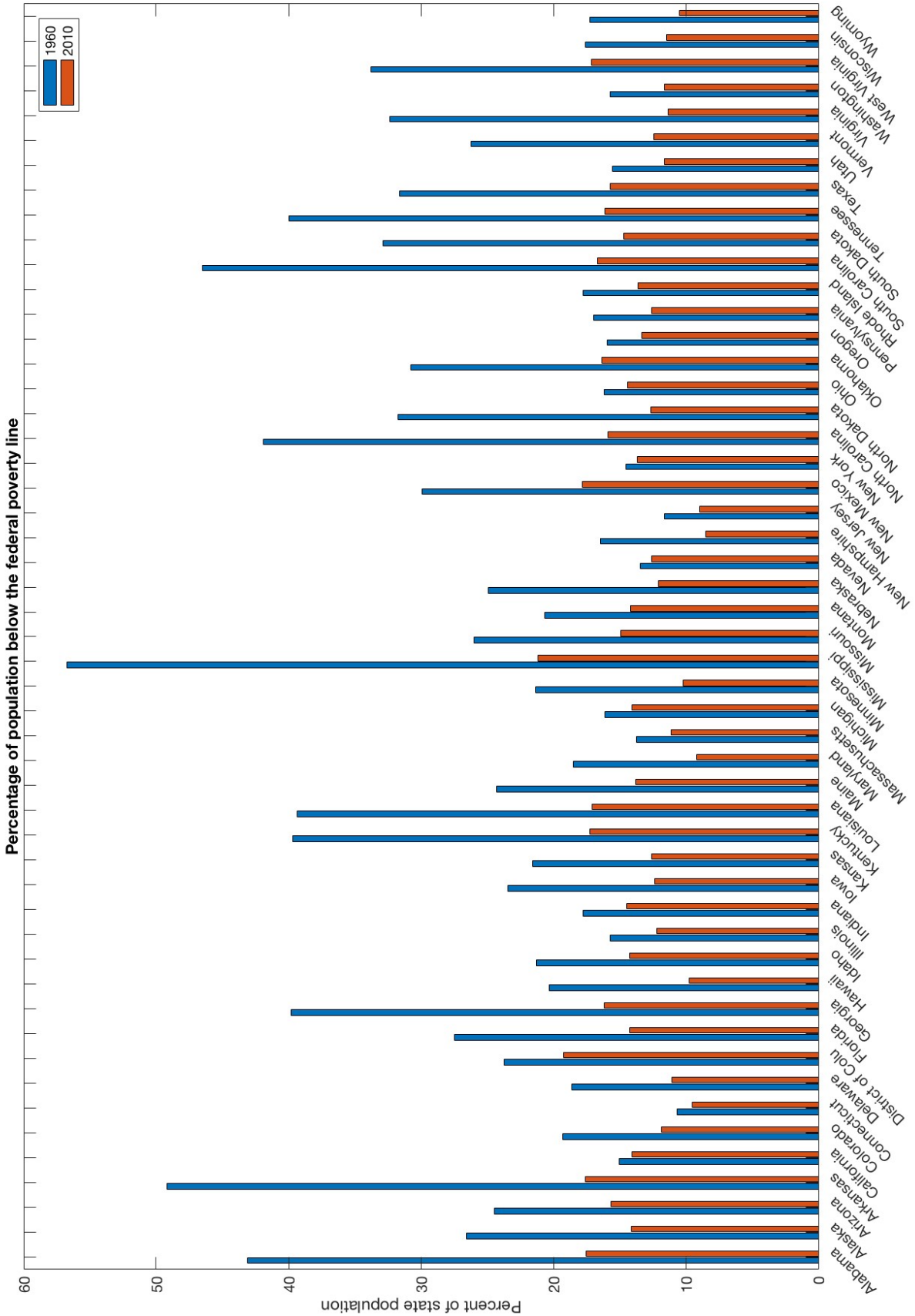

Figure 2: Percentage of families in poverty by state

top 1% in Connecticut was $2.2 million in Connecticut in 2011, compared with $635K in Hawaii. Moreover, the states with relatively large populations of poor households tend to be those with fewer rich payers. These distributional variations may limit the amount of redistribution which some of the states could achieve by themselves, suggesting a role for the federal government to reallocate resources *between* states.[5].

In order to capture the variation in state income tax systems, we use information from TaxSim to estimate the following tax function for each state:

$$T(y) = y - \lambda y^{(1-\tau)} \tag{1}$$

where $T(.)$ denotes net taxes, λ controls the average level of taxes and τ controls the progressivity. This functional form is shown in Heathcote et al. (2017) to provide a good fit for net taxes at the national level. The estimates of the progressivity parameter τ for the year 2000 are shown in Figure 3. As well as state income taxes, the results also reflect the impact of deductions and state earned income tax credit systems. In general, state income tax schedules are less progressive than the federal tax, but there is large variation across states, from no income taxation, to uniform taxation to more progressive systems (a value of 0 indicates either no income tax or a uniform tax rate).

We also see considerable differences across states in the provision of welfare programs. The most interesting cases are those of programs which receive federal funding but where states are given autonomy in the implementation of the programs, determining which services are provided, the eligibility requirements and the generosity of provision to recipients. Figure 4 shows the percentage of the population of each state receiving Temporary Assistance to Needy Families (TANF) funds, which provide cash assistance and work incentives to low income families, and the maximum monthly benefit. Figure 5 shows the recipient percentage and average monthly benefit for Medicaid[6]. In the case of Medicaid, even states which have similar proportions of recipients, such as Kentucky and Alaska, have widely differing benefit levels. It is also striking, however, that the availability of benefits does not seem to mirror the indicators of need - California, for example, has one of the most expansive implementations of TANF despite having one of the lowest proportions of poor households.

The total distributional effect of state and federal net transfers for the year 2000 is shown in Figure 6, which shows each state's income Gini coefficient before taxes, after Federal net transfers and after total net transfers; all incomes are adjusted for differences in local price levels. In every state, federal taxes and transfers achieved a substantial amount of redistribution, as measured by the decrease in inequality after the application of federal policies. However, states vary in how much more 'compression' they achieve in addition to this. For example, in South Dakota, there was virtually no further decrease in inequality once state policies are included, whereas New York carried out much more redistribution beyond that provided by the federal government. Moreover, there is no obvious pattern in the outcomes. Federal policies do not disproportionally affect richer or more unequal states;

[5]In addition, states have self-imposed balanced budget rules which provide legislative restrictions on the accumulation of debt.

[6]We should note here that the Medicaid benefits are in kind in the form of medical services rather than direct cash benefits. We provide equivalent cash values here.

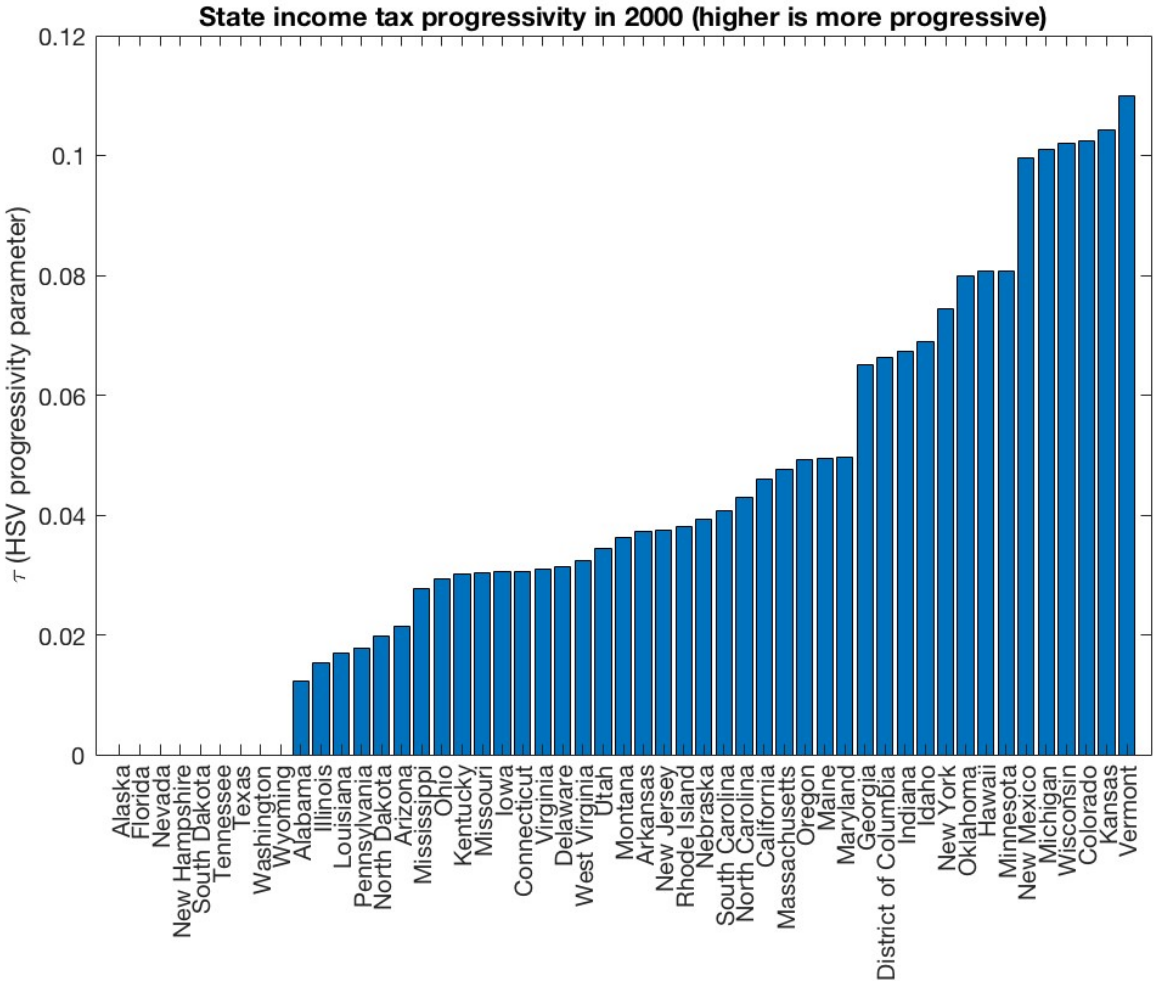

Figure 3: State tax progressivity parameters τ for HSV tax function $T(y) = y - \lambda y^{(1-\tau)}$

more equal states do not systematically carry out less redistribution than more unequal ones.

These observations raise the question of the extent to which autonomy at the state level is a constraint on our proposed federal objective of uniform insurance provision. As shown in Figure 1, the federal tax schedule does not discriminate between states. Funding designs such as matching grants can, however, change the effective price of spending on welfare programs (Ribar and Wilhelm, 1999). Nevertheless, the different implementations of transfer programs and local living cost differences point to the possibility that the *combined* (state and federal) tax and transfer system provides heterogeneous income insurance across states for households with comparable incomes. We aim to investigate this further through our analysis.

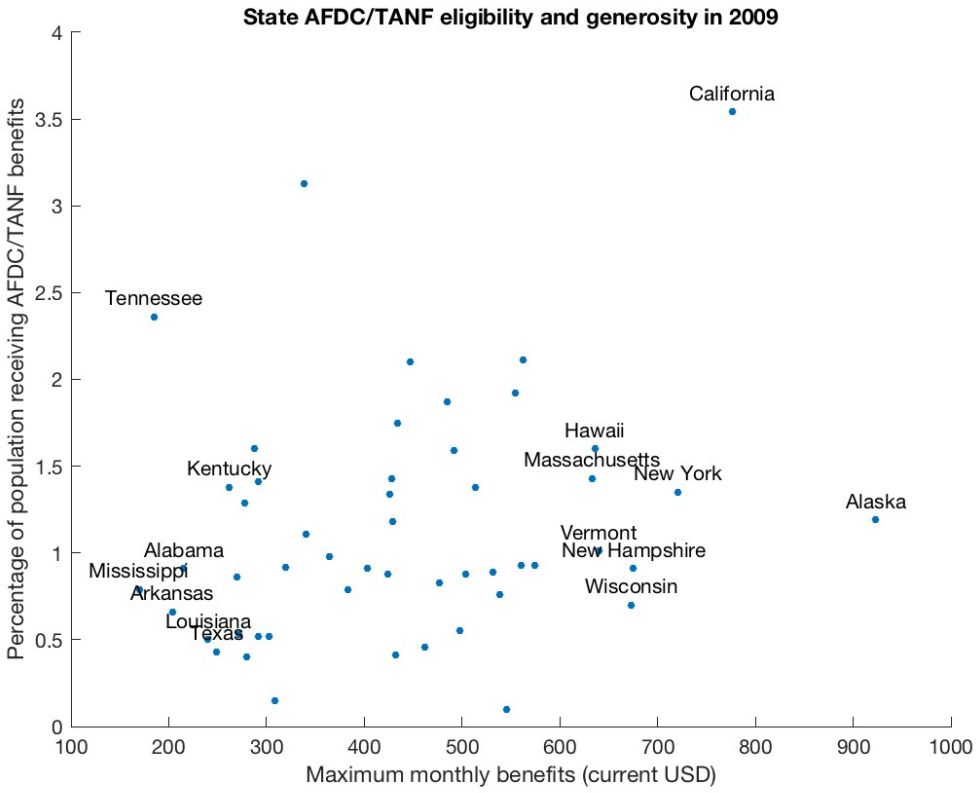

Figure 4: TANF Recipient density and benefit generosity by state in 2009

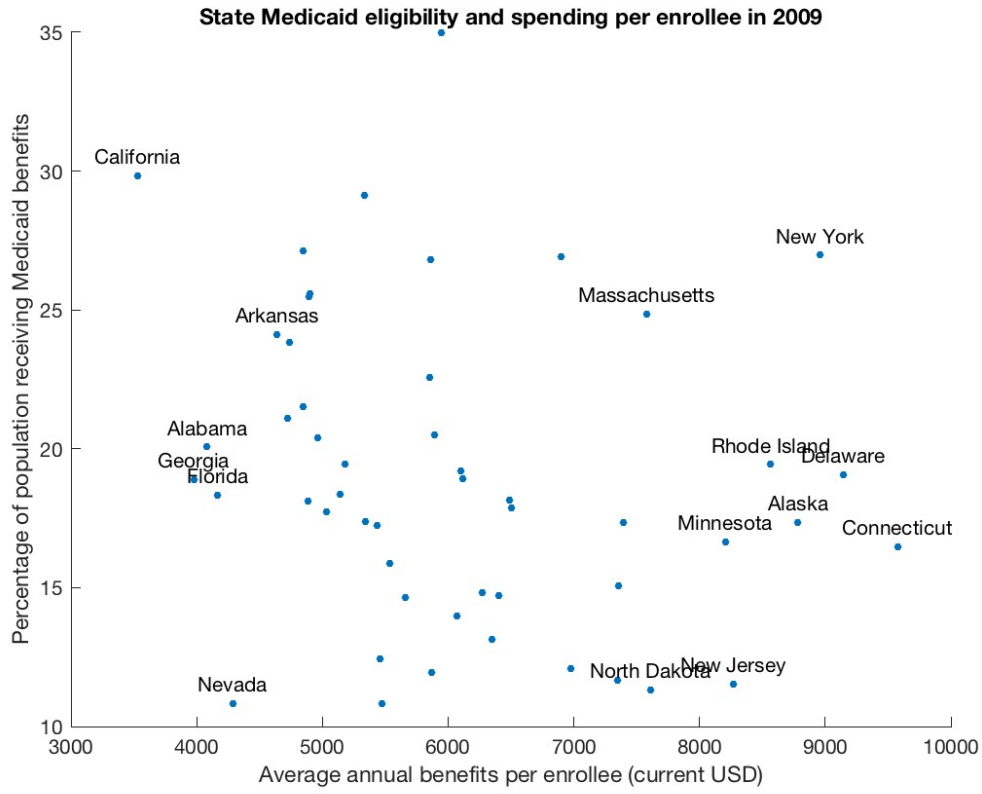

Figure 5: Medicaid Recipient density and benefit generosity by state in 2009

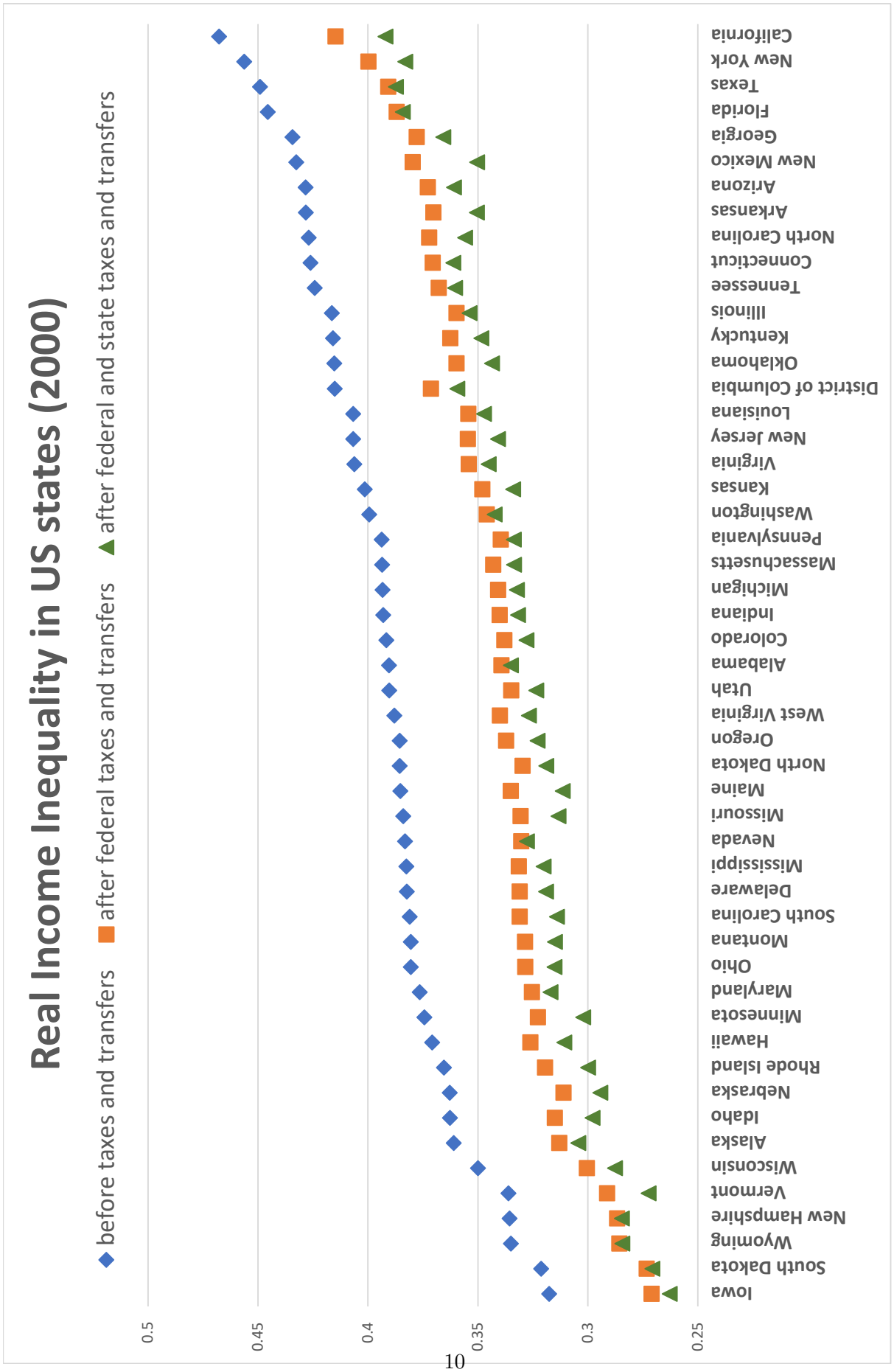

Figure 6: Gini coefficients by state, in the year 2000, for before tax income, disposable income after federal taxes and transfers and disposable income after all taxes and transfers. Calculated for the 'prototype' household in our main exercise

3 Our Experiment

We compute the response of taxes and transfers to a given change in household income by designing a model which captures the relevant features of US federal and state policies. In other words, we do not work with observed household data beyond incomes and rent payments conditional on household characteristics including residence and year. Instead, we construct a model which accounts for the differences in state tax and transfer programs and allows us to impute the changes instead of observing them. In effect, our model replicates the shape of the effective (marginal) tax schedule (taxes and transfers combined) as it is presented in, for example, Holt and Romich (2007) or Congressional Budget Office (2012) for different years and states along the distribution of household incomes.

In our empirical exercise we simulate the response of household disposable income to a negative shock to pre-tax income by accounting for changes in taxes and transfers. We construct a simplified version of the US tax and transfer system using a combination of previously available benefit calculators and our own calculators. In order to achieve this, we consider the main income support programs: Temporary Assistance for Needy Families (TANF, formerly Aid to Families with Dependent Children), Medicaid, Earned Income Tax Credits (both state and federal),[7] and the Supplemental Nutrition Assistance Program (SNAP, formerly Food Stamps). These programs account for large proportion of welfare spending in the United States. Their relative contributions are summarized in Appendix A.1.

Obvious omissions from this analysis are the unemployment insurance and Social Security systems. We choose not to include these because their eligibility and benefit levels depend on the individual's history of labour market participation and Social Security contributions. We therefore do not see these as providing *unconditional* protection against a reduction in income; instead they function more as a (subsidized) form of self-insurance which is managed by the federal government.

ADD HERE: Work by Beraja, Fuster, Hurst and Vavra (2015) found that, e.g. during the Great Recession, unemployment benefits were a quantitatively small source of insurance. They report that even those MSAs in which residents hat the lowest values of home equity, received a total of "16.3 billion in unemployment benefits payments in 2009 and 9.6 billion in 2008". (footnote 16, page 13). This is small compared to the Medicaid, TANF, EITC - NEED TO COMPLETE THIS.

3.1 The Prototype Family

In order to capture correctly the changes in tax liabilities and transfer entitlements, we consider a household with fixed characteristics across years and states. Assigning specific household characteristics and keeping them fixed is necessary to conduct our analysis correctly and addresses an important precondition for giving a meaningful answer to our research question. It is necessary as the sources of insurance we study depend not only on income but also on other household characteristics. For taxes, a critical determinant of liabilities and credits is the number of dependants of a tax filer and whether a couple is able

[7] In addition to the federal level EITC some states and even local governments provide their own tax credit systems.

to file jointly. In addition, the presence of children in the household grants specific child tax credits and deductions for childcare expenses. Mortgage expenditures and pension incomes are also deductible items.

Household characteristics are equally important to determine eligibility and generosity of the transfer programs we consider. For SNAP and AFDC/TANF the number of family members is a critical parameter. For Medicaid, a key element of the heterogeneity in eligibility across states is the extent to which children are covered. Hence, it is necessary to specify (and fix) children ages. For these reasons, our prototype family remains invariant throughout our microsimulation exercise with respect to relevant characteristics, listed as follows:

- A married couple with two children between ages 12 and 17
- Family income from two equal full time labour incomes
- No disabilities
- The family home is rented (no mortgage payments)
- No other family members occupy the home
- The family does not migrate as a response to changes in earnings

The advantage of our approach is that it allows us to capture differences in insurance provided by combined federal and state net transfers using a consistent benchmark. If we were to change family characteristics our results would be less informative for our research question. On the one hand, they would confound the differences we are interested in with potential differences in state government preferences over specific family types. On the other hand, if we were to vary the family composition between states and years to reflect state averages, we would not be able to separate the effects of federal from state policies consistently. This is because, as described above, family composition and size are key determinants of eligibility and benefit levels for welfare programs.

3.2 Simulation

For a given year, we then locate this prototype household in a particular state at the 10th and 90th percentiles of the *state* pre-tax income distribution[8] to capture the experience of a poor and a rich household respectively. Given the level of pre-tax income, we apply a negative real income shock of 10%. To convert the nominal pre-tax income to a real measure, we use a subsistence expenditure amount. We calculate this subsistence expenditure as the sum of two components. The first is the minimum required level of monthly food spending (as reflected in the federal Thrifty Food Plan, a US government measure which specifies the minimum amount which a family of a given size needs to spend to consume a basic diet). The second is the average monthly rent payment for households in the same state with similar characteristics and income. We consider both of these components as fixed costs for the household, in the sense that once a shock to income is realized, the household cannot respond by forgoing these expenditures.

[8] An alternative experiment would carry out the same analysis using the national income percentiles. We choose to locate the family relative to state income distribution because we believe that this is the relevant distribution from the perspective of a state social planner.

We obtain the conditional average monthly rent[9] for each year and state combination by obtaining the 5 and 15 percentile and 85 and 95 percentiles of the income distribution of families which are similar to our prototype family (we condition on marital status, family size as well as number and ages of children). We then average gross monthly rents across families who reported incomes within these groups for a given year and state.[10]. These averages constitute the rent component of our consumption measure for poor and rich families in the different states and years.[11]

We define the shock $\epsilon_{p,s}$, for a family at income percentile p and living in state s, as:

$$\epsilon_{p,s} = \kappa * \frac{w^0_{p,s}}{\bar{e}_{p,s}} \tag{2}$$

where κ is a constant, $w^0_{p,s}$ is the household's pre-tax income and $\bar{e}_{p,s}$ is the expenditure on the subsistence basket. To produce our desired 10% real income shock, κ is set to 0.1. We interpret $\epsilon_{p,s}$ as a shock which is similarly 'painful' for households with different incomes and locations. Thus, a household with a higher income will receive a larger shock than a household with a lower income in the same state; a household in a more expensive state will receive a smaller shock than a household with the same income in a cheaper state.

We also consider this shock as being unexpected by the household. Our results then measure the on impact response of tax and transfers; we therefore do not consider any other responses by the household such as changes in labour decision or asset positions. We then compare disposable income (i.e. income adjusted for taxes paid and transfers received) at the pre-shock and post-shock levels. This exercise is repeated for all US states. Under our basic assumptions about the objective of federal policy, the combined tax-transfer system should provide uniform insurance against such shocks.

For a pre-tax income of $w^0_{p,s}$, the value of pre-tax income after the shock is given by[12]:

$$w^1_{p,s} = w^0_{p,s} - \epsilon_{p,s} \tag{3}$$

The pre-shock and post-shock disposable incomes, $y^0_{p,s}$ and $y^1_{p,s}$ are then given by:

[9]The ACS variable which we use for rent ("RENTGRS") is "gross monthly rental cost of the housing unit, including contract rent plus additional costs for utilities (water, electricity, gas) and fuels (oil, coal, kerosene, wood, etc.)" As noted by IPUMS, this makes the variable more comparable across households than net rents and, as our aim is to capture all household expenditures related to housing, this variable is ideal for our purposes.

[10]Official measures of representative rents are computed in a similar way; for example, the Fair Market Rents (FMR), which are estimated by the US Department of Housing and Urban Development (HUD), correspond to the 40th percentile of the distribution of monthly rents of all units occupied by rent movers in a specified geographic area. As we are interested to estimate results for households with low and high incomes separately, we condition their average rents on the income distribution as described above.

[11]In some rare cases, the resulting averages appear unrealistic: They are either much lower than in the years before or the rent of poor households is higher than that of rich ones. The reasons for these anomalies are low number of observations. For those cases, we widen the bands of the incomes to the 2 and 18 and 82 and 99 percentiles respectively. We replace remaining outliers by linear interpolation using the values of leading and trailing years. As we report in the robustness section, these procedures do not affect our findings substantially.

[12]Here we suppress notation referring to the characteristics of the household, which will also determine eligibility for welfare programs and income tax credits. As explained above, we hold the relevant characteristics of the household fixed throughout the exercise.

$$y^0_{p,s} = w^0_{p,s} - \tau^f(w^0_{p,s}) - \tau^s(w^0_{p,s}) + g^f(w^0_{p,s}) + g^s(w^0_{p,s}) \tag{4}$$

$$y^1_{p,s} = w^1_{p,s} - \tau^f(w^1_{p,s}) - \tau^s(w^1_{p,s}) + g^f(w^1_{p,s}) + g^s(w^1_{p,s}) \tag{5}$$

where the superscripts f and s refer to federal and state government respectively, τ refers to taxes and g refers to transfers.

Our measure of the insurance provided by the combined tax and transfer system is:

$$\chi_{p,s} = 1 - \frac{\Delta_{p,s}}{\epsilon_{p,s}} \tag{6}$$

where

$$\Delta_{p,s} = y^0_{p,s} - y^1_{p,s} \tag{7}$$

measures the change in disposable income induced by the earnings shock. Thus, if disposable income declines by the entire amount of the shock $\epsilon_{p,s}$, the insurance measure $\chi_{p,s}$ will be zero, indicating that the system provides no insurance against the shock; conversely if disposable income does not decline at all, $\chi_{p,s}$ will be one, indicating full insurance. Intermediate values indicate partial insurance[13]. More generally, if household *pre-tax* income undergoes a negative shock of one subsistence basket, $1 - \chi_{p,s}$ is the number of baskets lost from *disposable* income due to changes in state and federal taxes and transfers.

4 Results

Figures 7 and 8 illustrate the average values of the insurance measure $\chi_{p,s}$ by state over the period 2000-2008, separately for rich households and poor households. A key question for our analysis is whether the patterns of social insurance which we see across states are in any way explained by the income distributions within each state. In particular we can look at the association with the average income level and the dispersion of income within each state.

Taking the insurance coefficients of the poor household first, we see that many states with GDP per capita above the US average appear high in the rankings. For example, New Jersey, Pennsylvania and Massachussetts have the highest average coefficients over this period, with 0.59, 0.58 and 0.54 respectively. However, there are some striking exceptions to this rule, such as Texas (0.11) and California (0.11). The poor performance of California is especially surprising since as discussed previously, this state implements fairly large low income support programs despite having a relatively low proportion of households in poverty. This mostly reflects the fact that our prototype household, which has two working parents, would not qualify for AFDC/TANF, and therefore does not benefit from California's generosity in this program. In addition, while California administered Medicaid benefits to a large percentage of the population in 2009 (Figure 5), the average annual benefits per recipient are comparatively low. In contrast, the performance of Texas is easily explained

[13]It is possible for states to have values above 1, in which case after tax transfers increase more than the amount of the shock, and negative values, which indicate that disposable income actually falls more than the value of the shock.

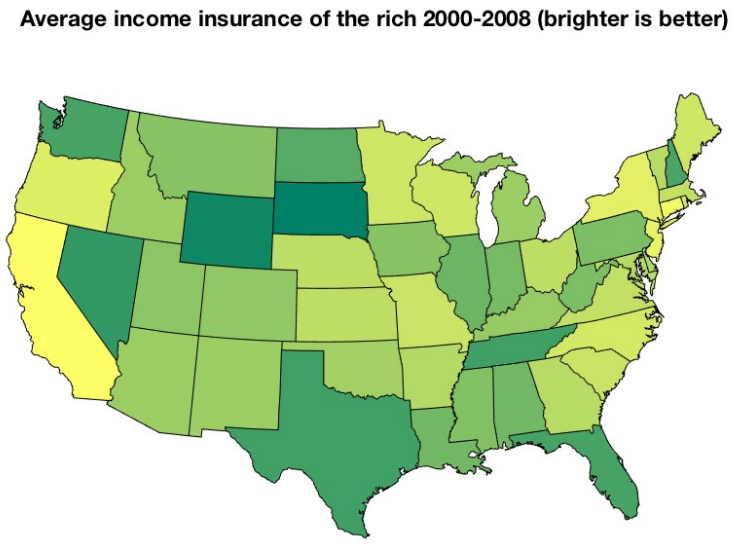

Figure 7: Insurance values for the rich, lighter shades indicate larger values; varies from maximum of 0.4 (California) to minimum of 0.28 (South Dakota)

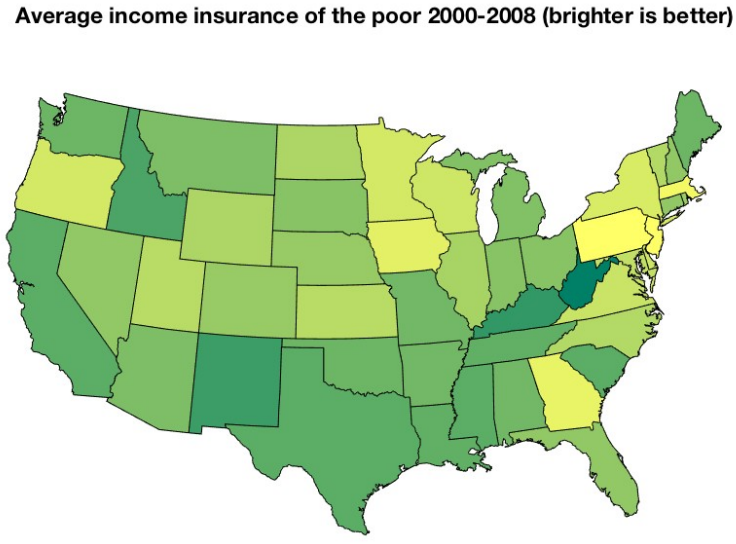

Figure 8: Insurance values for the poor; varies from maximum of 0.58 (Pennsylvania) to a minimum of -0.17 (West Virginia)

by its policy choices and high income level, the latter meaning that it receives grants less intensely from the Federal government.

As a corollary, we see that many poor states appear closer to the bottom of the rankings, such as Mississippi, Kentucky and West Virginia; in fact the last two of these states have *negative* insurance coefficients of -0.03 and -0.17 respectively, suggesting that their net transfer policies actually exacerbate the negative income shock suffered by the prototype poor family. This is what we would expect if the states were completely responsible for financing their own welfare policies, since these states have smaller tax bases. However, the fact that they have below average income levels means that they are eligible to receive larger grants from the Federal government; in particular, their Medicaid expenditures are subsidized at a much higher rate. Nevertheless, as shown in Figures 4 and 5, these states seem to implement TANF and Medicaid with strict eligibility rules and low generosity per enrollee.

For the rich household insurance coefficient, the overall picture is very different. Firstly, we note that there is much less variation across states, with the average coefficients ranging from 0.28 in South Dakota to 0.4 in California. By construction, our prototype rich household is not eligible for any of the welfare programs in our simulation. Consequently, the variation in the rich household coefficients comes either from the combined effect of the state and federal income tax schedules or differences in local living costs. In real terms, the progressivity of the federal tax schedule is more severe for the rich family when it is located in a more expensive state. Comparing Figure 7 with Figure 3, we see that the states which in 2000 had no income tax or uniform income tax systems ($\tau = 0$) provide the least insurance for the rich family.

The differences in state income distributions also play a role in these results, and may explain why the rich insurance coefficients do not completely follow the pattern of state tax progressivity once we move away from flat (or zero) taxes. Recall that the rich prototype household is defined relative to the *state* income distribution, rather than the national income distribution. As a result, rich households in states like Connecticut and New York, which have high GDP per capita, are rich compared to both the nation and the state, and so they face high tax progressivity in both the state and federal tax schedules. These states are therefore very high in the rich insurance rankings with average coefficients of 0.39 and 0.38 respectively. In contrast, Vermont has a lower coefficient of 0.36 (compared to a median of 0.35) despite having a highly progressive income tax. We can explain this by the fact that GDP per capita in Vermont is below the median for US states; a 'rich' household in Vermont may therefore be less rich relative to the national income distribution. This is confirmed by the finding in Sommeiller and Price (2014) that in 2011, the income threshold for entering the top 1% of earners in Vermont was $256,807 while the equivalent for Connecticut was $624,524.

We explore these patterns further by breaking down the relative contributions of the federal and state governments, which should provide more evidence for evaluating our claim that state government policies drive the differences in outcomes. For government level $i \in \{s, f\}$, we define $\chi^i_{p,s}$ as

$$\chi^i_{p,s} = \frac{\tau^i(w^0_{p,s}) - \tau^i(w^1_{p,s}) + g^i(w^1_{p,s}) - g^i(w^0_{p,s})}{\epsilon_{p,s}} \tag{8}$$

which is the ratio of the change in net transfers from government level i to the income shock. Since by definition $\chi_{p,s} = \chi^s_{p,s} + \chi^f_{p,s}$, the *relative* contribution of government level i is a useful measure. We define this as:

$$\rho^i_{p,s} = \frac{\chi^i_{p,s}}{\chi_{p,s}} \tag{9}$$

In Figure 9 we plot the relative federal contribution to insurance against the insurance coefficients for each state. The variation along the x-axis, which measures the average insurance coefficient for the poor family, again illustrates the geographical differences in the treatment of low income families. However, we also see that for any given level of insurance, there are also large differences in the composition of the changes in net transfers. For example, New Hampshire is slightly below the median in terms of insurance, but all of this insurance is provided by the Federal government; Florida, on the other hand, has a similar level of insurance, but only 40% of the change in net transfers is accounted for by the Federal government. Numerically, this means that if four subsistence expenditure baskets are taken away from the pre-tax earnings of the poor household in either state, in both states disposable income will fall by roughly three subsistence baskets; however, in New Hampshire the one basket which is not lost is entirely accounted for by an increase in net federal transfers, while in Florida, increased net state transfers account for 60% of this basket.

Overall, we see that there is a negative relationship between the total level of insurance and the Federal contribution to insurance, so that poor households receive more support in locations where the state government makes a higher contribution, and receive worse support in locations where they must rely entirely on the Federal government.

5 Concluding Remarks

We present a framework for comparing the level of income insurance received by household in different US states. Against the intuitive benchmark that the federal level of government should aim for uniform insurance to all residents once state policies are accounted for, we find considerable variation between states. In particular, we find that this variation is much greater for low income households and that it is driven primarily by differences in state fiscal policies. We take this as supporting the claim that differences in state welfare and tax policies determine the level of insurance which a poor household receives in each location.

We interpret these results as a demonstrating a limitation on the ability of central fiscal policy to provide uniform income insurance in a federal system. This partly reflects differences in the implementation of state-federal co-financed activities. Such differences are well documented (e.g. Clemens and Ippolito (2017); Floyd et al.). The results also reflect differences between states in design of their own welfare programs and tax schedules. Taken together, these variations in local government policies can act as a real constraint on the equalization efforts of the central government. Going forward, we would like to see whether there is any correspondence between the degree of income insurance in each state and the

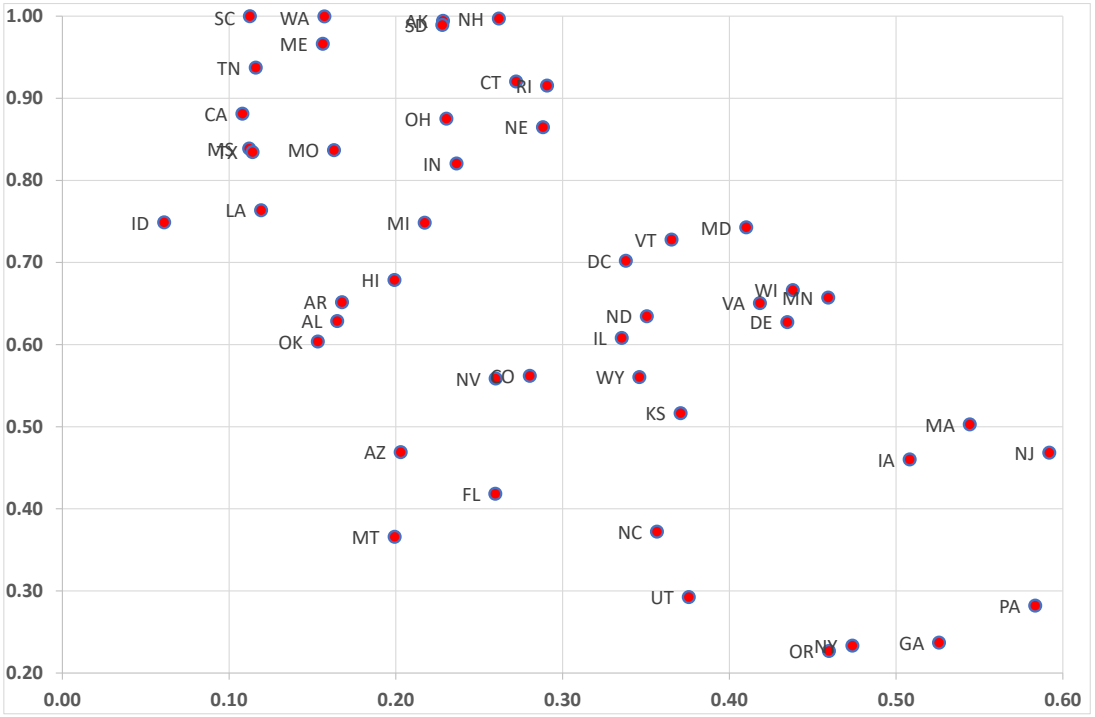

Figure 9: Insurance coefficients for low income households (x-axis) against federal insurance contribution (y-axis)

extent to which each state's welfare programs are funded by grants from the federal government.

We would also like to see whether there is a way of accounting for the patterns of insurance provision through differences in the income processes of different states. As documented in Caliendo et al. (2014), the sectoral compositions of the regional economies in the USA are very heterogeneous. It is possible that the resulting exposures to different economic sectors mean that a 'typical' pre-tax income shock is very different from one state to another. The state policies may then be responses to differing levels of income risk.

References

Alberto Alesina and Eliana La Ferrara. Preferences for redistribution in the land of opportunities. *Journal of Public Economics*, 89:897–931, 2005.

Pierfederico Asdrubali, Bent Sorensen, and Oved Yosha. Channels of interstate risk sharing: United states 19631990. *The Quarterly Journal of Economics*, 111(4):1081–1110, 1996.

Randy Alison Aussenberg. Supplemental nutrition assistance program (snap): A primer on eligibility and benefits. Crs report, Congressional Research Service, 2014.

Jon Bakija. Documentation for a Comprehensive Historical U.S. Federal and State Income Tax Calculator Program. Department of economics working papers, Williams College, 2017.

Robin Boadway and Jean-Franois Tremblay. Reassessment of the Tiebout model. *Journal of Public Economics*, 96(11):1063–1078, 2012.

Lorenzo Caliendo, Fernando Parro, Esteban Rossi-Hansberg, and Pierre-Daniel Sarte. The Impact of Regional and Sectoral Productivity Changes on the U.S. Economy. Working Paper 20168, National Bureau of Economic Research, May 2014.

Laura Castner. Trends in FSP participation rates: focus on 1994 to 1998. Technical report, U.S. Department of Agriculture, Food and Nutrition Service, 2000.

Jeffrey Clemens and Benedic Ippolito. Implications of medicaid financing reform for state government budgets. Working Paper 23965, National Bureau of Economic Research, October 2017.

Congressional Budget Office. Effective Marginal Tax Rates for Low- and Moderate-Income Workers. Report 43709, 2012.

Ife Floyd, LaDonna Pavetti, and Liz Schott. TANF Reaching Few Poor Families.

Roger H. Gordon and Julie Berry Cullen. Income redistribution in a federal system of governments. *Journal of Public Economics*, 96(11):1100 – 1109, 2012. Fiscal Federalism.

Kenneth Hanson and Margaret Andrews. State variations in the food stamp benefit reduction rate for earnings - cross-program effects from tanf and ssi cash assistance. Economic information bulletin number 46, U.S. Department of Agriculture, Economic Research Service, 2009.

Jonathan Heathcote, Kjetil Storesletten, and Giovanni L. Violante. Optimal tax progressivity: An analytical framework. *The Quarterly Journal of Economics*, 132(4):1693–1754, 2017.

Stephen D. Holt and Jennifer L. Romich. Marginal tax rates facing low– and moderate–income workers who participate in means–tested transfer programs. *National Tax Journal*, 60(2):253–276, 2007.

Hilary Hoynes and Diane Whitmore Schanzenbach. *U.S. Food and Nutrition Programs*, pages 219–301. University of Chicago Press, October 2015.

Hilary W. Hoynes and Erzo F.P. Luttmer. The insurance value of state tax-and-transfer programs. *Journal of Public Economics*, 95(11):1466 – 1484, 2011.

Hilary W. Hoynes, Leslie McGranahan, and Diane W. Schanzenbach. Snap and food consumption. *University of Kentucky Center for Poverty Research Discussion Paper Series, DP2014-03*, 2014.

Robert Moffitt, editor. *Economics of Means-Tested Transfer Programs in the United States*. University of Chicago Press, 2016.

Enrico Moretti. Real wage inequality. *American Economic Journal: Applied Economics*, 5 (1):65–103, jan 2013.

Wallace E Oates. An essay on fiscal federalism. *Journal of Economic Literature*, 37(3): 1120–1149, sep 1999.

David C. Ribar and Mark O. Wilhelm. The demand for welfare generosity. *The Review of Economics and Statistics*, 81(1):96–108, 1999.

Jonathan Rodden and Erik Wibbels. Fiscal Decentralization and the Business Cycle: An Empirical Study of Seven Federations. *Economics & Politics*, 22(1):37–67, mar 2010.

Steven Ruggles, Katie Genadek, Ronald Goeken, Josiah Grover, and Matthew Sobek. *Integrated Public Use Microdata Series: Version 7.0*. Minneapolis, MN: University of Minnesota, 2017.

Estelle Sommeiller and Mark Price. The Increasingly Unequal States of America: Income Inequality by State, 1917 to 2011. *Economic Analysis and Research Network Report*, 2014.

Antoinette Tremblay. Longitudinal imputation of sipp food stamp benefits. In *Proceedings of the Survey Research Methods Section, American Statistical Association*, 1994.

Jürgen Von Hagen. *Fiscal arrangements in a monetary union: evidence from the US*, pages 337–359. Springer Netherlands, Dordrecht, 1992.

Laura Wheaton and Kathryn Stevens. The effect of different tax calculators on the supplemental poverty measure. Research report, Urban Institute, 2016.

Parke Wilde. Understanding the food stamp benefit formula. Food assistance and nutrition research report number 14, United States Department of Agriculture, 2001.

A Appendix

A.1 Welfare Programs

Selected US governmental policies insuring income risk	**Expenditures (2007 USD)**		**Imputation**
FEDERAL	total (bn)	recipient/month	
Supplemental Nutrition Assistance Program (SNAP, 'Food Stamps')	30	96	calculator (own brew)
Earned Income Tax Credit (EITC)	49	165	federal tax (TaxSim)
STATE			
Medicaid	329	482	calculator (H. Hoynes)
Temporary Assistance for Needy Families (TANF, formerly AFDC)	12	234	calculator (H. Hoynes)
State Earned Income Tax Credit (SEITC)	NA	NA	state tax (TaxSim)
Unemployment insurance (UI)	*32*	*354*	*(not considered)*

Figure 10: Transfer programs included in simulation

Imputations

A.2 AFDC/TANF and Medicaid

Hoynes and Luttmer (2011) determined eligibility and benefits of the transfer programs "Temporary Assistance for Needy Families" (TANF; "Aid to Families with Dependent Children", AFDC, until 1996) and Medicaid. We use the same calculators and we cordially thank Hilary Hoynes for sharing them with us. The appendix of her paper provides details on the calculators so we just briefly describe their main features.

AFDC/TANF The benefit formula is given as

benefit = maximum benefit - benefit reduction rate × (earnings - earnings disregard) - unearned income

The state specific regulations regarding eligibility and generosity of this program materialize through differences in the earnings disregard, the benefit reduction rate and the maximum benefit. State policy makers enjoyed much less freedom to adjust program parameters prior to the introduction of the AFDC waivers and TANF. For years corresponding to this period the AFDC calculator uses "the most generous tax and disregards for all calculations" while, for years after 1996, the TANF calculator "does not take into account lifetime time limits or work requirements". Finally, the calculators assume a uniform take-up rate of 100%. Regarding the quality of the imputations produced by the calculators, Hoynes and Luttmer (2011) state that their calculations compare favorably with administrative data and other studies (see the appendix of their paper for details).

Medicaid Prior to 1987, eligibility for AFDC leads to mandatory eligibility for Medicaid. To capture the state determined Medicaid expansions in later years, Hoynes and Luttmer (2011) by include state and year specific eligibility parameters for child age and family income thresholds[14]) The benefits are established from administrative data on average expenditures per adult and child by state and year. Regarding take-up rate, the calculator

[14]Pregnancy eligibility is also accounted for by the calculator.

assumes 100% if eligibility arises through AFDC while the take-up rate for eligible children varies by year as given in other sources.

A.3 SNAP (Food Stamps)

Since we could not find a calculator to determine eligibility to the "Supplemental Nutrition Assistance Program" (SNAP, formerly "Food Stamps") and to impute benefits we followed Hoynes and Luttmer (2011) in constructing our own calculator. Our main reference to design its elements was Moffitt (2016), the chapter by Hoynes and Schanzenbach (2015) in particular, as well as the comprehensive summaries and benchmark imputations presented in Hoynes et al. (2014) and Tremblay (1994). We also consulted Aussenberg (2014), Wilde (2001) and Hanson and Andrews (2009) to familiarize ourselves with details on the SNAP definition of net income as presented in section A.3.2 and its interaction with other transfer programs.

A.3.1 Eligibility

In general, as SNAP is a federal program, the importance of state parameters for eligibility (and generosity) ia minor. In fact, they mostly result in marginally different definitions of countable assets in the means test. SNAP regulations define the unit for which eligibility needs to be established as consisting of all household members "who purchase and prepare food together". In concrete terms, any household has to meet three criteria to be considered eligible:

1. Gross monthly income has to be below or equal to 130% of the Federal Poverty Level (FPL).[15]
2. Net income (income after specified deductions, see section A.3.2) has to be below or equal to 100% of the FPL.
3. Countable assets may not exceed a certain amount.

Our calculator accounts for 1 and 2 but does not consider 3. This is because we have not been able to find the asset limits in current nominal US Dollars for the different years and family sizes as well as a comprehensive definitions of countable assets. As mentioned above, there are minor differences across states in this respect.

A.3.2 Benefits

Following the information provided in our references, the SNAP benefit formula is given as

$$\textit{SNAP benefit} = \textit{maximum benefit} - \textit{benefit reduction rate} \times \textit{net income}$$

[15] While the term FPL is used frequently, this measure actually refers to the 'Poverty Guidelines' (PG). They are published as current US Dollar amounts for varying family sizes each year in the Federal Register by the Department of Health and Human Services (HHS). Note that different PGs apply for Alaska and Hawaii which accounts for the higher cost of living in these two states.

Maximum Benefit We capture maximum benefits by making use of the fact the SNAP is designed to cover monthly food expenditures of families with different sizes as established by the Thrifty Food Plan (TFP)[16]. Hence, to obtain the maximum benefit data for various family sizes and years, we collected data on the current US Dollar amounts corresponding to the TFP.[17] As this information is not available in a consolidated database for the years we study, we combined information from several sources for different time periods:

- **1976 to 1995** We use data provided by Castner (2000) (Table B3). Note that current US Dollar amounts are only available for even years until 1990. For uneven years before, we use the average value of the preceding and following year.
- **1996 to 2003** We use data information from the "Supplemental Nutrition Assistance Program Quality Control Data". They are included in the quality control reports published by the U.S. Department of Agriculture's (USDA) Food and Consumer Service (FCS), which is administering SNAP (and already administered the program when it was called Food Stamp Program).[18]
- **from 2004** We use data from the Cost of Living Adjustment (COLA) database. The data are provided by the USDA's Food and Nutrition Service.[19]

As a consistency check, we compare the values from the different sources for years in which they overlap. We find that between 1990 and 2000, the data from Castner (2000) and the USDA are identical, while from 2000 to 2005, the USDA and COLA data are the same. Hence, we have confidence that the maximum benefits are correctly specified in our calculator.

Net Income Following the official program definitions, we establish SNAP net income as

	cash pre-tax income	(1)
–	standard deduction	(2)
–	20% deduction of earned income	(3)
–	excess shelter cost deduction	(4)
–	deduction for childcare costs associated with working and training	(5)
–	medical cost deduction for elderly and disabled	(6)
=	net income	(7)

As our prototype household does not meet the criteria captured in (4), (5) and (6), our calculator does not consider them. For (2), we could not find the data for different years

[16]"Benefits are tied to the cost of a market basked of foods which if prepared and consumed at home, would provide a complete, nutritious diet at minimal cost, the so-called Thrifty Food Plan, (...)." Moffitt (2016), page 226. The Thrifty Food Plan (TFP) measures the average monthly cost of a healthy meal plan for different family sizes. It is computed by the US Department of Agriculture and a key policy measure in setting nutritional cost standards.

[17]Note that Congress can choose to increase maximum benefits above the TFP level during economic downturns. For example, this was one element of the American Recovery and Reinvestment Act of 2009. Our calculator accounts for this temporary policy change.

[18]Mathematica Policy Research was contracted to produce the reports and datasets. Both are available at `https://host76.mathematica-mpr.com/fns/` See appendix C of the technical documentation for program parameters such as the maximum benefit, income screen etc.

[19]See `https://www.fns.usda.gov/snap/cost-living-adjustment-cola-information`

and family sizes so we omit this deduction. However, the calculator carefully considers the fact that SNAP regulations define cash pre-tax income listed in (1) to exclude in-kind benefits and tax credits. In other words, (1) does not include Medicaid, state and federal earned income as well as child tax credits. It does include include cash transfers. While disbursements of social security, disability income and unemployment insurance would meet this criterion, they are not relevant due to the specification of our prototype household. What matters for our household are AFDC/TANF transfers which our SNAP calculator adds to cash pre-tax income.

Benefit Reduction Rate While the official SNAP benefit reduction rate is 0.3, Hoynes and Schanzenbach (2015) argue that the rate which applies in practice is below this statutory value because of the deductions to net income described above. Another source of variation of the benefit reduction rate is described in Hanson and Andrews (2009). They show that, from a household perspective, the SNAP benefit reduction rate is subject to interaction with other welfare programs such as AFDC/TANF. As the benefits of these programs vary by state and year, the SNAP benefit reduction rate is likely to vary across states and years as well. To account for this issue, we simulate our model with two different benefit reduction rates (0.3 and 0.15). However, our results are robust as the quantitative changes induced by this variation are minor. This is because eligibility is not affected by the benefit reduction rate (see section A.3.1) and because those households which receive SNAP benefits have very low values of net income.

A.3.3 Take-up rates

The USDA publishes annual reports titled "Estimates of State Supplemental Nutrition Assistance Program Participation Rates". These reports document that participation rates vary considerably across states and years. It has been pointed out that these differences are partly associated with asymmetric state business cycle movements and other state and local policies such as school lunch and emergency food programs. Moreover, participation rates also depend on the amounts of collectable benefits. As we are interested to study a household which is comparable across years and states (our prototype family), we do not account for differences in take up rates in our SNAP calculator. On the one hand, this is because we aim to measure the maximum amount of transfers available to households and not those actually collected. On the other hand, we do not want to capture outcomes which are plausibly linked to specific state (and year) effects to keep our results focused on comparability.

A.4 Taxes

We use TaxSim to obtain federal and state liabilities for different years and states. TaxSim provides federal taxes since 1960 and state taxes since 1977. Importantly, it includes state and federal earned income tax credits and accounts for different state rules on deductibility of federal taxes as well as child care tax credits. Moreover, it allows to account for household characteristics such as number of children which are relevant determinants of a family's actual total tax burden. We use the income data we obtained from the data (see above) corresponding to poor and rich families in the different years and states. Moreover, we account for transfer incomes imputed by our calculators described above, i.e. we make

sure to use the best estimate for taxable income.

How accurate are our federal and state tax imputations? We first note that TaxSim is the almost exclusive tool used for this purpose so our imputations are no worse than those of the vast majority of other contributions. Second, since we cannot observe the tax data we are interested in (see above discussion), we have to rely on imputation. Hence, the only benchmark for comparison are alternative tax calculators. To the best of our knowledge, there are two other candidates: The tax calculator developed and maintained by Bakija (2017) and the Urban Institute's Transfer Income Model (TRIM).[20] To judge if any of these alternatives is strictly superior to TaxSim for the purpose of our project, we present below a succinct summary of Wheaton and Stevens (2016) who conduct a detailed comparison of all three tax calculators.

Federal Taxes For federal income taxes (table 2A), there are only negligible differences between the three tax calculators. All three are either equally close to or far from the target defined by administrative tax data. Differences between them are always in the ballpark of two to three percentage points.[21] This impression is confirmed by the more detailed comparisons presented in table 2B and applies even more to tax credits (table 2C) where the three alternatives produce virtually identical results.

State Taxes Regarding state income taxes (tables A4 and 4B) TRIM performs consistently worse than TaxSim and Bakija. While they are close in terms of meeting the target, it appears that TaxSim is marginally superior. For state earned income tax credits, all three are lining up closely but TaxSim seems again a marginal winner based on the summary evaluation presented in the final rows of table 4C.

As Wheaton and Stevens (2016) demonstrate the relative performance of the three tax calculators also depends on the source of the tax variables. However even for different inputs (Census or TRIM tax variables), the variation between them remains minor. Since we are using our own input variables – which are different from the ones used by Wheaton and Stevens (2016) – we conclude that conditional on our inputs the variation across the different calculators is likely to be small and that TaxSim is overall the best choice for our project. Therefore, we think the imputation procedure of federal and state taxes is the best we can achieve as we have no reason to believe that any of the other tools would give more accurate results.

A.5 Data inputs

As inputs to our simulation model, we obtain data on households in different years and states from the Integrated Public Use Microdata Series (IPUMS, Ruggles et al. (2017)) USA dataset. It provides cross-sectional variables on households in different states and years (dating back as early as 1850). Since we only have state taxes since 1977, we choose 1980 as the first year of our analysis. IPUMS assembles information from several sources, such as the decennial censuses (for years 1980 and 1990) and the American Community

[20] See here http://trim.urban.org/T3Welcome.php

[21] The only exception is the alternative minimum tax where TRIM performs better than TaxSim and Bakija by eight and five percentage points respectively.

Survey (ACS; annual since 2000). Importantly, variable codes and labels are harmonized across years and data sources so that they consistently contain the same information.

A.5.1 Household Income

We use total annual family income[22] as the income variable of households and classify households as poor or rich based on the 10% and 90% percentiles of the corresponding state and year distributions. This measure for income comprises current USD amounts of annual "total pre-tax money income earned by one's family from all sources". Since this variable sums the incomes of all family members who are related to the head it excludes incomes of family members who are not related to the head. To check if this aspect makes a quantitative difference, we also use a personal income variable[23] which "reports income earned from wages or a person's own business or farm for the previous year" and sum it for all family members (related to the head or not) by using the family relationship variables. The results are virtually identical.

[22] IPUMS variable is "FTOTINC"
[23] "INCEARN"