THE ECONOMIC IMPACTS OF TAX EXPENDITURES: EVIDENCE FROM SPATIAL VARIATION ACROSS THE U.S.[1]

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ABSTRACT

This paper develops a framework to study the effects of tax expenditures on intergenerational mobility using spatial variation in tax expenditures across the United States. We measure intergenerational mobility at the local (census commuting zone) level based on the correlation between parents' and children's earnings. We show that the level of local tax expenditures (as a percentage of AGI) is positively correlated with intergenerational mobility and that this correlation is robust to introducing controls for local area characteristics. To understand the mechanisms driving this correlation, we analyze the largest tax expenditures in greater detail. We find that the level and the progressivity of state income taxes are positively correlated with intergenerational mobility. Mortgage interest deductions are also positively related to intergenerational mobility. Finally, we find significant positive correlations between state EITC policy and intergenerational mobility. We conclude by discussing other applications of this methodology to evaluate the net benefits of tax expenditures.

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I. Introduction

Tax expenditures – the exemption of certain economic activities from taxation – account for over a trillion dollars of annual federal, state, and local government spending.[2] Reducing tax expenditures is thus a potentially powerful way to reduce budget deficits. However, tax expenditures may also provide important benefits to the economy – e.g., by stimulating entrepreneurship and growth, increasing equality of opportunity, or providing better access to health care. This tradeoff makes it important to identify the costs and benefits of major tax expenditures to determine which expenditures are most valuable.

Given the importance of this question, a large literature studying the impacts of tax expenditures has developed over the past several decades. Previous work investigating the impacts of tax expenditures has largely relied on analysis at the national level. For example, a recent volume edited by Poterba (2011) includes several studies evaluating the economic effects of tax expenditures and reviews the voluminous previous literature on this issue. Virtually all of these studies exploit time series variation in federal tax expenditures – e.g., in the allowance for mortgage interest deductions or other tax credits. The limitation of such studies is that time series variation in tax expenditures is naturally correlated with many other factors that may affect the economy, such as changes in other government policies or the strength of the economy. Thus evidence on the benefits of tax expenditures remains limited.

In this paper, we address these empirical challenges using differences in tax expenditures across cities in the U.S. to identify the benefits of tax expenditures. There is considerable local variation in tax policy and expenditures that arises from variation in local policies that interact with the federal tax code. For instance, because state income taxes are deductible for federal tax purposes, states with higher income tax rates effectively receive larger tax expenditures than those that have higher sales taxes instead. Such local variation provides useful counterfactuals for outcomes in the absence of tax expenditures and thus can yield much sharper estimates of the impacts of tax expenditures.

To harness the power of spatial variation, we use population tax data covering all tax filers in the U.S. from 1996-2011. Population tax data provide information on a variety of economic outcomes of interest at a high level of spatial granularity. Such data are essential for the approach we propose here because one cannot obtain precise estimates of outcomes of interest within each city from publicly available survey datasets.

There are a variety of outcomes that one could study to evaluate the efficacy of tax expenditures. For instance, one can investigate whether tax expenditures raise local income levels, increasing homeownership rates, change educational outcomes, affect mortality rates, stimulate new business starts, etc. As a first step in this research agenda, we focus on intergenerational mobility as the outcome of interest in this paper. We focus on intergenerational mobility because many tax expenditures are loosely motivated by the goal of expanding opportunities for upward income mobility for low-income families. For example, deductions for education and health costs, progressive federal tax deductions for state income taxes, and tax credits aimed at low-income families such as the Earned Income Tax Credit (EITC) all are targeted toward providing increased resources to low income families with children. Are these

[2]This total refers to the sum of individual tax expenditure estimates and does not take into account interactions among different tax expenditures.

tax expenditures effective in promoting income mobility?[3]

The literature on intergenerational mobility in the U.S. has largely focused on obtaining accurate national estimates of intergenerational mobility (for example, Zimmerman 1992 and Mazumder 2005). For a survey of the literature, see Black and Devereux (2011). This literature has not been able to convincingly investigate potential drivers of mobility due to a lack of sufficient data on variation within the US. The conclusions from cross-country research on mobility and tax policy, such as Solon (2002), are limited by the large number of confounding factors that vary across nations.

We begin our analysis by constructing new local (census Commuting Zone, hereafter CZ) measures of intergenerational mobility. The CZs correspond to MSAs for the largest cities but also cover rural areas and smaller towns and form a partition of the United States. There are about 750 CZs in the full United States.

Our measures are based on the correlation between parents' income rank (in percentiles) and their adult children's income ranks within each CZ. We analyze inter-generational mobility indices at the national level to show that this rank-rank correlation is the single most robust statistic to capture inter-generational mobility in local areas. Areas with higher intergenerational elasticity (IGE) by this measure are less mobile, i.e. differences in parent income lead to higher average differences in child income.

Next, to measure the effect of tax expenditures, we correlate our measure of intergenerational mobility with overall tax expenditures as a percentage of AGI. We then analyze the progressivity of those tax expenditures, as measured by the difference in tax expenditures for the highest and lowest earners as a percentage of AGI.

We find that both the level and progressivity of CZ tax expenditures are positively correlated with higher levels of intergenerational mobility. These relationships are robust to the inclusion of a broad range of local demographic controls. An increase of overall tax expenditures by 1% of AGI in a CZ decreases the parent-child income correlation by .5 percentage points, relative to the mean correlation of 0.33. In addition, we find evidence that the tax expenditure components of mortgage interest deductions, state income taxes, and state EITCs each have individually positive effects on intergenerational mobility. The progressivity of overall tax expenditures and state income taxes also have a robust, significant relationship with higher intergenerational mobility. Overall, these results suggest that tax expenditures aimed at low-income taxpayers can have significant impacts on economic opportunity. Hence, the short-term fiscal gains from reducing such expenditures must be weighed against the potentially large long-term costs of reduced income growth for low income individuals.

In addition to providing new evidence on the role of tax expenditures in mobility, our analysis contributes to the literature by using new comprehensive population data to compute intergenerational mobility at the local level. These CZ measures of tax expenditures and intergenerational mobility are provided in the Appendix for future research.

The remainder of the paper proceeds as follows. Section 2 describes the tax expenditure and intergenerational mobility data used for our analysis. Section 3 presents the main analysis of the relationship between tax expenditures and intergenerational mobility. Section 4 concludes and outlines directions for future research.

[3]Prior work on tax expenditures (e.g. Rosen 1985, Clotfelter 1985) has investigated other types of responses to specific expenditures such as the mortgage interest deduction or charitable giving. However, this paper is the first to analyze the impacts of such expenditures on intergenerational mobility.

II. Data Construction

II.A Local Tax Expenditure Data

Local CZ tax expenditure data are constructed from the Internal Revenue Service SOI Individual Income Tax Statistics ZIP Code Data from 2008. This publicly available dataset includes 5-digit ZIP Code totals for 2008 number of returns, Adjusted Gross Income (AGI), total itemized deductions, mortgage interest deductions, and federal Earned Income Tax Credit (EITC) by seven AGI classes.[4]

To measure local tax expenditures, total AGI and total itemized deductions are aggregated across all AGI classes and combined to the CZ level. CZ total itemized deductions are then measured as a percentage of total AGI, effectively resulting in CZ mean total itemized deductions as a percentage of AGI. Figure 1 maps this measure of overall CZ tax expenditures by dividing CZs into ten equally sized deciles. Darker areas represent areas with higher total itemized deductions relative to AGI. To measure the progressivity of tax expenditures, we use the difference in total itemized deductions as a percentage of AGI for the lowest AGI class, under $10,000, and the highest AGI class, $200,000 and over. The progressivity of tax expenditures varies greatly across CZs. Figure 2 maps this measure by CZ. Darker areas represent regions with more progressive local tax expenditures.

Mortgage interest deductions are aggregated from ZIP-5 AGI class totals to CZ overall mortgage interest deduction totals and measured as a percentage of AGI. Mean mortgage interest deductions for each AGI class are calculated by dividing CZ total mortgage interest deductions by the number of returns. Inequality of mortgage interest deductions by CZ is measured as the difference between the mean mortgage interest deduction for the top AGI class ($200,000 and over) and the lowest AGI class (under $10,000). To avoid mechanical scaling effects, we control for local housing prices in our analysis of mortgage interest deductions. A categorical variable indicating median house price bracket is obtained from the 2000 Census for each ZIP-5, and combined with housing counts to obtain CZ measures of local housing prices.

State income marginal tax rates for the 2008 tax year are obtained from The Tax Foundation (2012).[5] We use the marginal tax rate for individuals with taxable incomes of $40,000 to measure the overall level of state income taxes. To measure the progressivity of state income tax rates, we compute the difference in the marginal tax rate for the top bracket specified for the given state and the marginal tax rate for incomes of $20,000. New Jersey has the most progressive state income taxes by this measure, with a 7.22% difference in marginal tax rate for taxable incomes over $500,000 and taxable incomes of $20,000.

Lastly, CZ mean state EITC amount is calculated by multiplying the CZ mean federal EITC amount by the state EITC rate in 2008.[6] States without a state EITC are assigned a $0 mean state EITC amount. Twenty-three states and the District of Columbia offered a state EITC in 2008, with a rate ranging from 3.5% of the federal EITC in Louisiana to 40% of the federal EITC in the District of Columbia.

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[4] The AGI classes are "Under $10,000", "$10,000 to $25,000", "$25,000 to $50,000", "$50,000 to $75,000", "$75,000 to $100,000", "$100,000 to $200,000", and "$200,000 and more."

[5] See http://taxfoundation.org/article/state-individual-income-tax-rates-2000-2012 for state individual income tax rates in 2008.

[6] See Table 1 of the Center of Budget and Policy Priorities review at http://www.cbpp.org/files/6-6-08sfp1.pdf for a complete list of state EITC rates for 2008.

II.B Constructing Intergenerational Mobility Measures

The sample of children used to calculate local intergenerational mobility measures consists of all children who were born in 1980 or 1981 and are US citizens as of 2011. These children are then matched to taxpayers who claimed them as dependents when they are age 25 or younger in IRS tax records spanning 1996-2011. We define the primary parent for all years as the person who claims the child in the earliest year.[7] We restrict our main analysis to the 1980-1 pooled cohorts of children but we present in appendix Table 4 various robustness checks for other cohorts and samples.

We use two measures of income in our intergenerational elasticity (IGE) measures: F1040 income and wage earnings. The former is a household income measure derived from IRS Tax Form 1040 and is the sum of reported adjusted gross income, adding social security income, and tax exempt interest, less taxable social security income. Wage earnings is the sum of wages across W2 forms, social security and railroad retirement benefits paid across SSA-1099 forms, unemployment income from F1099G forms for an individual and his or her spouse, and self-employment income. Parent income is defined as the average yearly F1040 income across 1996-2000 in base 2010 dollars. Child income is defined as the average of 2010 and 2011 F1040 in base 2010 dollars.[8] Table 0 presents basic summary statistics for our main sample of interest.

Matched parent-child pairs are assigned a local geography (CZ) based on the earliest non-missing ZIP-5 reported on the primary parent's F1040 tax form or the ZIP-5 of the W2 with the largest salary if the parent did not file a F1040 in a given year. We restrict the final sample to primary parents with non-missing CZs and non-negative parent income.

Parents are assigned an income rank by dividing the sample of parents into 100 evenly sized income centiles, determined nationally.[9] Children are analogously assigned an income rank based on their adult income, using national based centiles of child income. Each matched parent-child pair is therefore given a parent rank (0-100) and a child rank (0-100).

Appendix Figure A1, top panel, plots the relationship between parent income and child income nationwide, and shows that there is a positive link between parent income and children's median income as adults. This relationship is concave, as there are diminishing returns to having higher parent income in levels. Appendix Figure A1, bottom panel, plots the mean rank of child income against the rank of their parents' income. The figure demonstrates that the relationship between a parent's income percentile and a child's income is roughly linear across the entire distribution, with some fanning out at the upper tail. Appendix Figure A2, top panel shows that the rank-rank slope relationship is fairly stable once children' income is measured after age 25. Appendix Figure A2, bottom panel shows that the rank-rank slope relationship is very stable by age of the parent. In most of the analysis, we use 1980-1 cohorts (and hence measure children income at age 30-31). For some parts of the analysis, we use 1980-5 cohorts based on the robustness findings from appendix Figure A2, top panel. Appendix Figure A3 depicts the rank-rank slope IGE slope between parents' income and child income by varying the number of years used to compute parental income (top panel) and children income (bottom panel). It shows that the number of years used has a small impact on the IGE when at least 4 or 5 years of parental income are used and when at least 2 years of children income are used. Hence, in our base

[7]When there are two individuals associated with one dependent, as in the case of married-filing-jointly or married-filing-separately taxpayers, we choose randomly between them to define the primary parent.

[8]If a matched parent or child does not have any forms on file for a given year, we impute zero income for that year.

[9]Parents with incomes exactly equal to zero are assigned a 0 rank, resulting in 101 total ranks (0-100).

specifications, we use 5 years of parental income (1996-2000) and 2 years of children income (2010-2011).

Appendix Figure A4, top panel depicts the density distributions of children income for various percentiles of the parent distribution. It shows that both the mean and variance of the children income distribution increases with the parents' income percentile. The bottom panel displays the standard deviation of children ranks across CZs by parental percentiles and shows that variance first declines with parental rank and then stabilizes. The statistics presented in appendix Figures A1 to A4 are gathered in appendix Table 2. Appendix Table 3 further provides the transition matrixes by quintiles in all CZs for the 1980-5 birth cohorts (and blanking all 13 CZs with less than 250 children).

Appendix Figure A5 illustrates that the linear relationship between parent's income percentile and children's earnings outcomes holds over the full earnings distribution in five representative cities, with different slopes and intercept levels across cities.

This analysis leads us analyze local intergenerational mobility using the rank-rank correlation between parent income and children' earnings. The parent rank-child rank intergenerational mobility measure used below is simply the OLS regression coefficient of a within-CZ regression of child rank on parent rank. Figure 3 maps the rank-rank intergenerational mobility measure by CZ. Darker colors represent higher income correlations, i.e. lower intergenerational mobility.

A complete list of CZ rank-rank intergenerational mobility correlations is included in the Appendix excel file Table 1. Also included is a measure of upward mobility: the probability of an adult child of parents in the bottom within-CZ income quartile being in the top within-CZ income quartile. All statistics in that table are always based on at least 250 observations. We blank outcomes for the 60 CZs which have less than 250 children for the 1980-1 pooled cohorts and for the 13 CZs which have less than 250 children for the 1980-5 pooled cohorts.

Appendix Figures A7 and A8 provide evidence using movers that the variation across cities that we are documenting is not due to sorting only and reflects in part causal effects of cities, such as tax policies, other government programs, or specific social capital of each city.

The top panel of Appendix Figure A7 depicts the actual mean child income rank against the expected income rank of the child given the parent income and CZ of residence before the child turned 13 (in blue) and after the child turned 25 (in red). The graph shows that place of residence of parents after the child turns 25 has no predictive power for child rank, suggesting that the effects of places is in part causal. The bottom panel shows the effect of moving to a city with more upward mobility on child outcome by age at which the move takes place and confirms that the time spent in a CZ has an impact on child income outcomes as adults, confirming that the variation across places we have documented in in part causal.

III. The Effects of Tax Expenditures on Intergenerational Mobility

In this section, we present our analysis of the links between tax expenditures and economic mobility. We start with the link between overall tax expenditures and intergenerational mobility and then turn to specific components of tax expenditures.

III.A Overall Tax Expenditures

We first analyze overall tax expenditures. We are interested in the effects of both the level of tax expenditures and the progressivity of tax expenditures on intergenerational mobility. We measure the level tax expenditures at the local level (CZ) as the ratio of aggregate itemized deductions to aggregate AGI in the CZ and measure progressivity of tax expenditures as the difference in the percentage of aggregate itemized deductions relative to aggregate AGI in the CZ for top bracket taxpayers (AGI above $200,000) to low bracket taxpayers (AGI below $10,000). See Section 2.1 for complete details.

Figure 4 displays a binned scatterplot of the relationship between CZ aggregate tax expenditures as a percentage of AGI in 2008 and the CZ IGE as measured by the correlation between parent rank income and child rank income (See Section 2 for more details on the construction of the tax expenditure and IGE measures). To generate the binned scatterplot, we group CZs into centiles (one-hundred equal-sized bins) on tax expenditures as a percentage of AGI, weighting by CZ population. The dots represent the weighted means of the IGE and tax expenditure measure. The best-fit line is calculated from a regression on the CZ level data and shows a negative relationship between the local level of tax expenditures and the rank-rank correlation.

Next, using a similar structure, Figure 5 displays a binned scatterplot of the relationship between progressivity of CZ tax expenditures and IGE as measured by the correlation between parent rank income and child rank income (CZs with over 300% difference in tax expenditures are excluded from the figure and best-fit line). Again, the best-fit line shows a negative relationship between the progressivity of tax expenditures and the rank-rank correlation.

The negative relationships depicted in Figures 4 and 5 suggest that places with higher or more progressive tax expenditures have more inter-generational mobility, i.e., a lower correlation between parents' income rank and children' income rank. To formally measure the effects of different tax expenditures on intergenerational mobility, we use OLS regressions of the form:

$$IGE_i = \alpha + \beta * EXPEND_i + \gamma * X_i + \varepsilon_i \quad (1)$$

for CZ i, where IGE_i is the parent rank-child rank correlation using within-CZ income centile ranks described in Section 2.2, $EXPEND_i$ is the measure of tax expenditures of interest described in Section 1.1, and X_i is a vector of CZ characteristic controls including CZ median income and percentage of the population that is a 4-year-college graduate, white, black, Hispanic and other.

Table 1 reports estimates of β for the level and progressivity of tax expenditures as a percentage of AGI, weighting by the population in each CZ. Column 1 reports the results of a regression of IGE on CZ tax expenditures. The coefficient is negative and significant; CZs with higher tax expenditures have significantly lower parent-child income correlation, i.e. higher intergenerational mobility. A one standard deviation increase in CZ percentage tax expenditures, 4.09% of AGI, decreases CZ parent-child income correlation by 0.18 standard deviations. Put differently, a 1% increase in CZ percentage tax expenditures decreases the parent-child income correlation by .5 percentage points, relative to the CZ national mean of 0.33. This result is robust to inclusion of demographic controls in column 2. The coefficient however is significantly smaller when state fixed effects are included in column 3.

To study the progressivity of tax expenditures, in Columns 4-6 we replicate the analysis in Columns 1-3 using the difference in mean percentage tax expenditures for files under $10,000 AGI and over $200,000 AGI.[10] Progressivity of tax expenditures has a similar effect on intergenerational mobility. A one standard deviation increase in CZ difference between lowest and highest bracket tax expenditures, 45.3% of AGI, decreases the correlation between parent and child incomes by 0.02, or 0.35 standard deviations, relative to a national CZ mean of 0.33. Including demographic controls and state fixed effects decreases the magnitude of the coefficient, but the effect remains significant.

Overall CZ levels of tax expenditures and progressivity of tax expenditures are positively related to intergenerational mobility. Our analysis demonstrates that places with high and more progressive tax expenditures have lower correlation of parent-child mobility and higher intergenerational mobility. Tax expenditures include a large number of different tax components, which may individually have different impacts on intergenerational mobility. For this reason, we turn to analysis of three specific tax expenditure components: mortgage interest deductions, state income taxes, and state EITCs.

The relationship between tax expenditures and intergenerational mobility may not be causal if the OLS identification assumptions fail to hold. Omitted factors may explain both higher local tax expenditures and greater intergenerational mobility. The potential problems with a causal interpretation of our results should be kept in mind throughout our analysis of specific tax expenditures.

III.B Specific Tax Expenditures

Tax expenditures include a number of components. The two most important ones quantitatively are (1) mortgage interest deductions, (2) state and income local tax deductions. Hence, we focus on these two tax expenditures.

Mortgage interest deductions. Mortgage interest deductions are the largest federal tax expenditure. These deductions may impact economic opportunity by providing opportunities for credit-constrained middle and low income families to become homeowners.

In Columns 1-3 of Table 2, we report estimates for the effect of CZ mortgage interest deductions on intergenerational mobility. We find a negative and statistically significant effect of CZ mortgage interest deductions on parent rank-child rank correlation that is robust to the inclusion of demographic controls and state fixed effects. The effect is comparable in size to the effect of overall tax expenditures: a one standard deviation increase in mortgage interest deductions as a percentage of AGI decreases the parent-child IGE by 0.34 standard deviations on average across CZs. Columns 4-6 repeat the analysis using inequality of mortgage interest deductions as measured by the level difference in mean mortgage interest deductions for the highest and lowest AGI classes, including controls for local housing prices from 2000 Census estimates. The basic regression reported in Column 4 yields a statistically significant positive coefficient – implying that areas with relatively larger mortgage interest deductions by high relative to low income taxpayers, i.e. more regressive mortgage interest deductions, are less economically mobile. This result is not robust, however, to the inclusion of controls in Columns 5-6.

In sum, there is some evidence that CZs with larger mortgage interest deductions as a

[10]Three outlier CZs with very low AGI totals (904, 101, and 830) are excluded from the regressions in Table 1, Columns 4-6.

fraction of AGI are more economically mobile. It is possible, however, that this relationship is not causal if mortgage deductions are correlated with other omitted factors related to intergenerational mobility. Further research isolating quasi-experimental variation in mortgage deductions is needed to understand the causal impacts of such deductions more precisely.

State income tax rates. Itemized deductions include state and local income taxes. State and local income taxes depend on both the level of income of individuals and the local or state income tax rate. Hence, this component of itemized deductions is naturally endogenous to income. To eliminate this endogeneity issue, we focus instead on the state tax rate policy. We measure the level of state income taxes by the marginal tax rate in the state for a taxable income level of $40,000 and measure progressivity of the state income tax with the difference between the state top marginal tax rate and state marginal tax rate for a taxable income of $20,000.

Table 3 presents results of an analysis of state income tax rates and IGE. In Column 1, we find that a 1% increase in state income tax rate decreases the intergenerational income correlation, i.e. increases intergenerational mobility, by 0.9% of the CZ mean IGE. This coefficient is not significantly changed by the inclusion of demographic controls. In Columns 3-4, we find that states with more progressive individual income tax rates have statistically significant higher intergenerational mobility, robust to the inclusion of demographic controls.

Both the level of state income taxes and its progressivity positively affect mobility (i.e. lower the IGE correlation). A natural potential explanation for this relationship could be alleviating credit constraints by taxing higher incomes and redistributing toward credit constrained lower incomes with higher educational expenditures. However, the relationship may not be entirely causal if these aspects of state taxes are correlated with other characteristics that could partly drive the results. For example, states with higher and more progressive state taxes may also have other state policies promoting economic opportunity and mobility.

III.C Local Policy: State EITCs

To further analyze the role of local income tax policy, we next focus on the largest state tax level transfer program, the state EITC. The federal EITC is a refundable tax credit aimed at low-income families. Eligibility for the federal EITC is determined by total earnings and the number of qualifying children.[11] Twenty-three states and the District of Columbia offered state EITCs in 2008, motivated by evidence of the impacts of the federal EITC on outcomes for low-income taxpayers (see Meyer 2010 for a survey of the literature). State EITCs "piggyback" on the federal EITC and offer a fixed percentage of the federal credit.[12]

The effect of state EITCs on intergenerational mobility is presented in Table 4. Column 1 presents a negative relationship between mean state EITC amount, as described in Section 2.2, and CZ parent-child income correlation, though the result is not significantly different from zero. In Column 2, including CZ demographic controls results in significant negative effect of state EITC amount and intergenerational income correlation.

A one standard deviation increase in mean state EITC amount, $32, decreases intergenerational correlation by 0.13 standard deviations. In Column 3, we regress on the state

[11] See IRS Publication 596 (Internal Revenue Service 2011) for details on federal program eligibility and rules.

[12] Minnesota offers a varying rate of the federal EITC credit depending on income and Wisconsin offers a varying state EITC based on the number of children. For our analysis, Minnesota is assigned its average rate of 33% and Wisconsin is assigned the 4% rate for single child families. For more information on state EITCs, see Levitis and Koulish (2008).

EITC rate directly, obtaining a significant negative result. In Column 4, we use a 2SLS design and instrument for mean state EITC using state EITC rate, and obtain a similar significant estimate as in Column 3. The results from Table 4 suggest that state EITCs may play a role in promoting intergenerational mobility. However, these results have a similar caveat to the case of state income tax rates, namely that state EITC generosity could be correlated with other state level policies that favor opportunity and effect intergenerational mobility.

III.D Controlling for other local area variables

In order to examine in more depth whether omitted variable bias can affect our estimates, we next analyze how adding observable local area variables can affect the correlation between the tax policy variables and intergenerational mobility that we documented above. For simplicity, we focus on the state EITC measure.

All but two of these extra variables are constructed with publicly available data, either IRS zipcode level variables or census data variables. The two variables constructed with IRS data are (1) the fraction middle class defined as the fraction of parents in the CZ from our sample who fall between the 25^{th} and 75^{th} percentile of the national income distribution of parents from our sample, (2) the share of income in the CZ that accrues to parents in the CZ who belong to the national top 1% of the parents income distribution. These two variables are reported for each CZ in appendix Table 1. All the other variables are local area variables available from public sources and widely used in socio-economic studies.

We consider variables measuring local government expenditures, local area income distribution and segregation statistics, quality and affordability of K-12 and higher education (where quality is defined as average test score of students in the CZ), the level of local social capital, family structure, and migration variables. We choose these variables because all these channels can potentially impact intergenerational mobility.

Table 5 presents coefficients of regressions of upward mobility in the CZ on the each of these 25 variables separately, i.e., we run separate univariate regressions. The table shows that besides the tax variables, which are positively related to mobility as we saw, local government expenditures, income equality and low segregation, social capital, quality of K-12 education, and fraction of households with children who have married parents, are all positively related to mobility. Quality and affordability of higher education as well as the level of migration flows are only weakly related to mobility.

Next in Table 6, we bring together a subset of the income segregation variables to assess whether the state EITC effects we have documented are robust to introducing controls for income inequality and income segregation within the CZ. The table shows that local income equality is positively related to upward mobility and that both segregation of poverty and segregation of affluence matter with segregation of poverty being more important. Importantly, however, the positive effect of state EITC on upward mobility remains even when the segregation measures are included in the regression.

Finally, in Table 7, besides the state EITC variable in the top row, we include a wider set of variables including high-school dropping out rate, social capital, fraction single mothers, and a measure of local income dispersion. The table shows that state EITC is no longer significant with this wider set of control variables. The last two columns however show that state EITC is significant when including the share black solely and the share black along with the share of households that are headed by a single mother. Therefore, Table 7 implies that the effect of the state EITC on mobility is partly but not fully robust to the inclusion of this wider set of variables.

As mentioned above, the appendix Table 1 provides upward mobility measures for each CZ and can be used by other researchers to deepen this analysis by bringing additional local area variables obtained from public sources.

IV. Conclusions

In this paper, we combine local CZ data on tax expenditures and local tax return income data to investigate the relationship between tax expenditures and economic opportunity. Our results demonstrate consistent and fairly robust relationships between higher local tax expenditures and lower intergenerational elasticity (IGE), i.e. higher economic mobility. This pattern emerges both in considering overall tax expenditures and individual analyzes of mortgage interest deductions, state income taxes, and state EITCs. The progressivity of tax expenditures and state income taxes have the strongest correlations with intergenerational mobility. Overall, our results suggest that local variation in tax expenditures plays a significant role in explaining variation in intergenerational mobility across the US.

Our analysis also makes two contributions that may be useful for further research on tax expenditures and issues related to income mobility. First, we have constructed new geographic data on intergenerational mobility, which provides measures of local economic opportunity by CZ. Future researchers can use this mobility data to analyze its determinants and improve our understanding of the role of tax policy in affecting economic opportunity. To assess the causal effects of tax expenditures, future research could focus on isolating exogenous changes in tax policy, and especially local tax policy, and analyzing local outcomes using quasi-experimental research designs.

Second, the broader contribution of this paper lies in illustrating the potential of a spatial research design to gain insight into the impacts of tax expenditures. This design exploits local variation in tax policies and previously unavailable local level data on outcomes to identify policy impacts. Future research can extend this research design to study a broad range of important outcomes including innovation, housing markets, labor markets, and other indicators of well-being to provide a more comprehensive perspective on the benefits of tax expenditures.

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TABLE 0

Summary Statistics for Baseline Sample: Children Born in 1980-81

Variable	Mean	SD
Parents		
Household Income	83,344	200,754
Fraction Married	69.11%	46.20%
Fraction Female of Single Filers	72.22%	44.79%
Children		
Household Income	44,756	79,389
Fraction with Zero Income	6.77%	25.13%
Fraction Female	49.85%	50.00%
Fraction Married	43.85%	49.62%
Attend College between 18-21	58.36%	49.30%
Observations	6,269,187	

Notes: This table provides summary statistics for the baseline sample of children born in 1980-1 and matched to parents with non zero income in 1996-2000.

TABLE 1

Tax Expenditures and Intergenerational Mobility

Dep. Var.:	CZ Rank-Rank Parent and Child Income Correlation					
	(1)	(2)	(3)	(4)	(5)	(6)
Avg. Tax Expenditures (% of AGI)	-0.00500	-0.00410	-0.00119			
	(0.000481)	(0.000482)	(0.000705)			
Avg. Tax Expenditures (% of AGI): Highest - Lowest Bracket				-0.000757 (4.55e-05)	-0.000379 (3.55e-05)	-0.000116 (3.48e-05)
Demographic Controls		X	X		X	X
State Fixed Effects			X			X
R-squared	0.128	0.680	0.862	0.278	0.698	0.865
Number of CZs	741	740	740	721	720	720

Notes: Each column reports estimates from an OLS regression run at the CZ level, weighted by the number of individuals in each CZ. Standard errors are reported in parentheses. The dependent variable is the coefficient of a within-CZ OLS regression of 100-bin parent income rank and 100-bin child income rank in 2011. Tax expenditures are the within-CZ mean individual tax expenditures as a percentage of individual Adjusted Gross Income (AGI) in 2008, aggregated from zipcode data in the IRS Individual Income Tax Statistics (2008). Column 2 adds CZ demographic controls, and column 3 adds state fixed effects. Columns 4-6 replicate columns 1-3 regressing on the difference between mean percentage tax expenditures for tax filers under $10K AGI and tax filers over $200K AGI. The demographic controls include CZ median income and the percentage of the population that is a 4-year college graduate, white, black, Hispanic, and other using data from the 2000 Census.

TABLE 2
Mortgage Interest Deduction and Intergenerational Mobility

Dep. Var.:	CZ Rank-Rank Parent and Child Income Correlation					
	(1)	(2)	(3)	(4)	(5)	(6)
Avg. Mortg. Int. Deduction (% of AGI)	-0.0129	-0.00765	-0.000863			
	(0.000932)	(0.000740)	(0.00120)			
Avg. Mortg. Int. Deduction ($1000s): Highest - Lowest Bracket				-0.000583	-0.00235	0.00154
				(0.000684)	(0.000512)	(0.000639)
Demographic Controls		X	X		X	X
State Fixed Effects			X			X
R-squared	0.205	0.694	0.862	0.254	0.692	0.909
Number of CZs	741	740	740	721	720	720

Notes: Each column reports estimates from an OLS regression run at the CZ level, weighted by the number of individuals in each CZ. Standard errors are reported in parentheses. The dependent variable is the coefficient of a within-CZ OLS regression of 100-bin parent income rank and 100-bin child income rank in 2011. Mean mortgage interest deduction is the within-CZ mean individual mortgage interest deduction as a percentage of Adjusted Gross Income (AGI) from the IRS Individual Income Tax Statistics (2008). Column 2 includes CZ demographic controls, and column 3 adds state fixed effects. Columns 4-6 replicate columns 1-3 with the difference in mean individual mortgage interest deduction for tax filers with over $200K AGI and filers below $10K AGI, including a dummy variable for the CZ median housing price category obtained from 2000 Census estimates. The demographic controls include CZ median income and the percentage of the population that is a 4-year college graduate, white, black, Hispanic, and other using data from the 2000 Census.

TABLE 3

State Income Tax Rate and Intergenerational Mobility

Dep. Var.:	CZ Rank-Rank Parent and Child Income Correlation			
	(1)	(2)	(3)	(4)
State Income Tax Rate (%):	-0.00230	-0.000475		
$40K Bracket	(0.000748)	(0.000519)		
State Income Tax Rate (%):			-0.00988	-0.000818
Top Bracket - $20K Bracket			(0.000791)	(0.000679)
Demographic Controls		X		X
R-squared	0.013	0.649	0.174	0.649
Number of CZs	741	740	741	740

Notes: Each column reports estimates from an OLS regression run at the CZ level, weighted by the number of individuals in each CZ. Standard errors are reported in parentheses and clustered by state. The dependent variable is the coefficient of a within-CZ OLS regression of 100-bin parent income rank and 100-bin child income rank in 2011. State income tax rates are as of January 1, 2008 from the Tax Foundation (2012). Column 2 includes CZ demographic controls. Columns 3-4 replicate columns 1-2 using the difference in state income tax rate for the top state tax bracket and the tax bracket including individuals with $20K annual income. The demographic controls include CZ median income and the percentage of the population that is a 4-year college graduate, white, black, Hispanic, and other using data from the 2000 Census.

TABLE 4
State EITC and Intergenerational Mobility

Dep. Var.:	CZ Rank-Rank Parent and Child Income Correlation			
	(1)	(2)	(3)	(4)
Mean State EITC ($1000s)	0.258	0.147		0.126
	(0.0647)	(0.0420)		(0.0440)
State EITC Rate (%)			0.000377	
			(0.000132)	
Demographic Controls		X	X	X
Regression Design	OLS	OLS	OLS	IV
R-squared	0.021	0.655	0.654	0.653
Number of CZs	741	740	740	740

Notes: Each column reports estimates from an OLS regression run at the CZ level, weighted by the number of individuals in each CZ. Standard errors are reported in parentheses. The dependent variable is the coefficient of a within-CZ OLS regression of 100-bin parent income rank and 100-bin child income rank in 2011. Mean state EITC is the within-CZ mean individual federal EITC amount from the IRS Individual Income Tax Statistics (2008) multiplied by the state EITC rate in 2008. Mean state EITC amount is recorded as zero for states without a state EITC. Columns 2-4 add CZ demographic controls. Column 3 uses state EITC rate, as a percent, as the explanatory variable. Column 4 instruments for Mean State EITC using the state EITC rate in a 2SLS regression. The demographic controls include CZ median income and the percentage of the population that is a 4-year college graduate, white, black, Hispanic, and other using data from the 2000 Census.

TABLE 5

Tax and other Correlations with Intergenerational Mobility

Dep. Var.:	E[Child Rank|Parent=p25]	
	(1)	(2)
Local Expenditure	0.215	(0.076)
State Tax	0.199	(0.141)
State EITC Rate	0.231	(0.109)
Student Expenditure	0.251	(0.094)
High-school Dropout Rate	-0.639	(0.064)
Score	0.557	(0.086)
College Return	-0.276	(0.137)
College Tuition	-0.003	(0.060)
Colleges per capita	0.102	(0.042)
Inc. at p75 - Inc. at p25	-0.475	(0.089)
Share of Income of Top 1%	0.178	(0.068)
Share Black	-0.605	(0.065)
Black Isolation	-0.513	(0.065)
Segregation of Poverty	-0.405	(0.063)
Migration Inflow	-0.184	(0.075)
Share Foreign Born	-0.016	(0.060)
Migration Outflow	-0.098	(0.069)
Mean Household Income	0.109	(0.075)
Income Growth Rate	0.561	(0.066)
Share Manufacturing	-0.260	(0.081)
Trade Shock	-0.274	(0.124)
Social Capital Index	0.617	(0.091)
Religiosity	0.510	(0.087)
Crime Rate	-0.326	(0.101)
Share Single Moms	-0.763	(0.078)
Share Single Moms (kids of married)	-0.652	(0.094)
Divorce Rate	-0.688	(0.108)
Teen birth Rate	-0.550	(0.091)

Notes: The dependent variable is the fitted value (with parent rank at 25) of a within-CZ OLS regression of 100-bin parent income rank and 100-bin child income rank in 2011. Each row reports estimates from an OLS regression against the variable in the left-most column. Column 1 reports the slope coefficients and Column 2 reports standard errors that are clustered at the state level. We standardize our dependent variable (the fitted value) and all right-hand-side variables to have mean 0 and variance 1.

TABLE 6

EITC Rates, Segregation of Income, and Intergenerational Mobility

Dep. Var.:	E[Child Rank|Parent=p25]					
	(1)	(2)	(3)	(4)	(5)	(6)
State EITC Tax Rate		0.912		0.905		0.956
		(0.362)		(0.371)		(0.355)
Segregation of Poverty (<p25)	-0.940	-0.914			-2.337	-2.490
	(0.226)	(0.207)			(0.584)	(0.585)
Segregation of Affluence (>p75)			-0.687	-0.639	1.495	1.689
			(0.248)	(0.235)	(0.617)	(0.630)
Number of CZs	378	378	378	378	378	378

Notes: The dependent variable is the fitted value (with parent rank at 25) of a within-CZ OLS regression of 100-bin parent income rank and 100-bin child income rank in 2011. Each column reports estimates from an OLS regression run at the CZ level. Standard errors clustered at the state level are reported in parentheses.

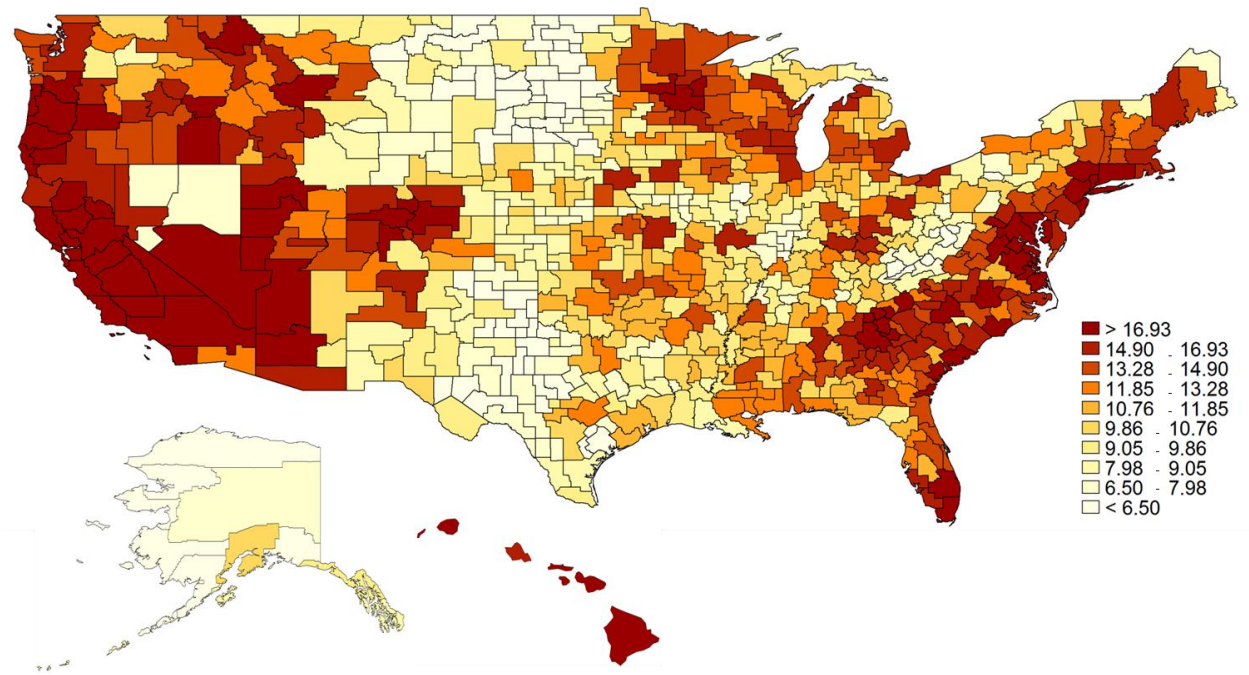
TABLE 7

EITC Rates and Intergenerational Mobility

Dep. Var.:	E[Child Rank|Parent=p25]			
	(1)	(2)	(3)	(4)
State EITC Rate	0.031		0.146	0.094
	(0.037)		(0.078)	(0.059)
Highschool Dropout Rate	-0.206	-0.207		
	(0.059)	(0.041)		
Inc. p75 - Inc. p25	-0.200	-0.183		
	(0.022)	(0.022)		
Social Capital Index	0.265	0.112		
	(0.055)	(0.056)		
Share of Single Moms	-0.426	-0.353		-0.761
	(0.058)	(0.054)		(0.089)
Share Black			-0.584	0.020
			(0.064)	(0.073)
State FEs		X		
Number of CZs	546	546	680	680

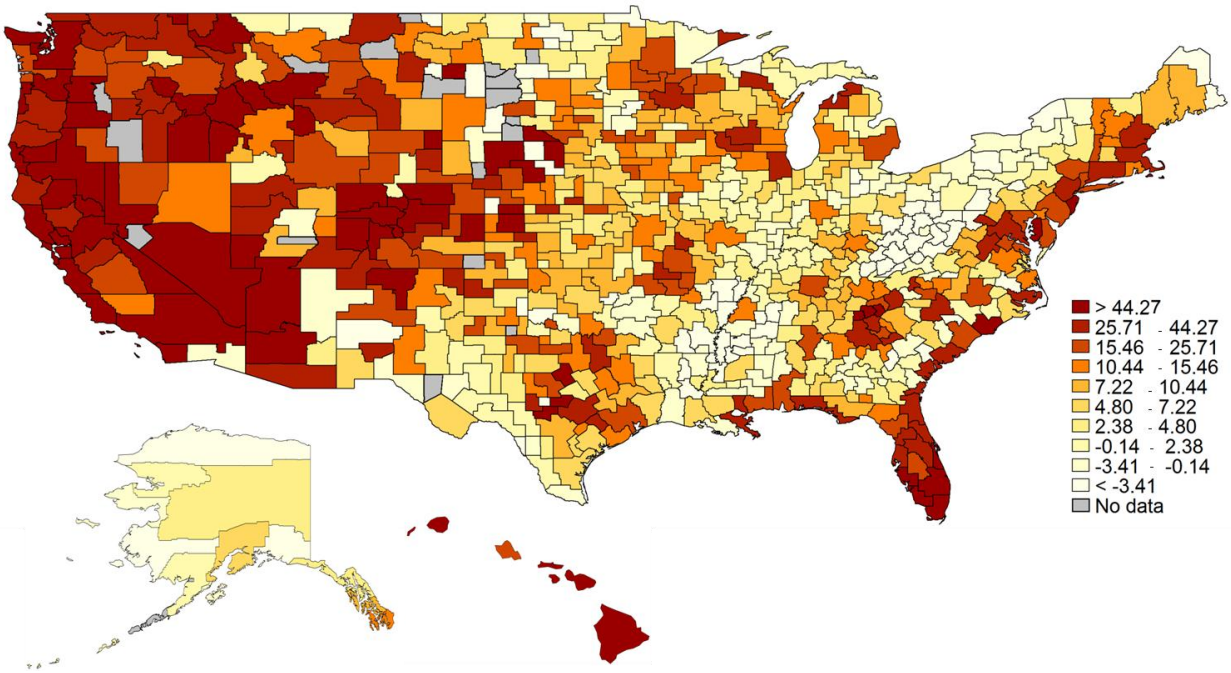
Notes: The dependent variable is the fitted value (with parent rank at 25) of a within-CZ OLS regression of 100-bin parent income rank and 100-bin child income rank in 2011. Each column reports estimates from an OLS regression run at the CZ level. Standard errors clustered at the state level are reported in parentheses. Column 2 adds state-level fixed effects.

FIGURE 1
Overall Tax Expenditures (% Tax Expenditures/AGI)



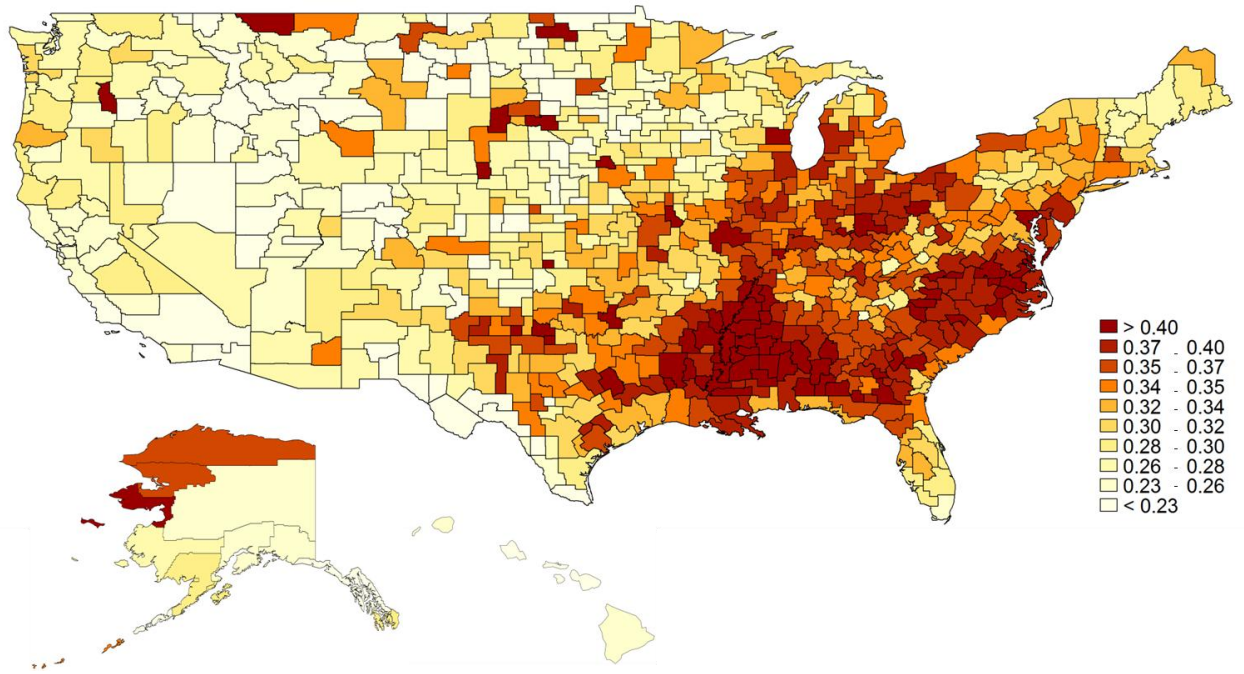
Notes: This figure maps CZ mean tax expenditures as a percentage of average Adjusted Gross Income (AGI). Darker areas represent higher tax expenditures. Data are from the IRS Statistics of Income ZIP Code Individual Income Statistics (2008).

FIGURE 2
Progressivity of Tax Expenditures
(% Tax Expenditures/AGI, for Lowest - Highest AGI Class)



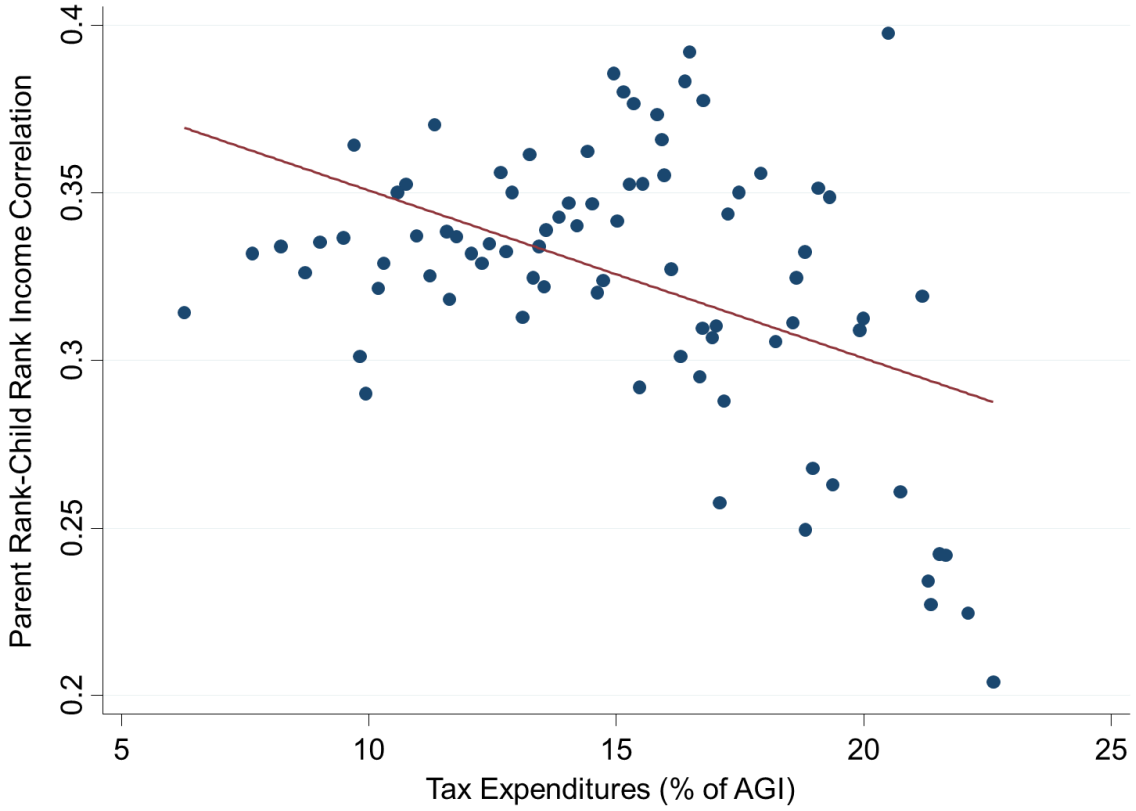
Notes: This figure maps CZ difference in mean tax expenditures as a percentage of average Adjusted Gross Income (AGI) for individuals with less than $10,000 AGI and individuals with over $200,000 AGI. Darker areas represent more progressive tax expenditures. Data are from the IRS Statistics of Income ZIP Code Individual Income Statistics (2008).

FIGURE 3
Intergenerational Mobility (Parent-Rank and Child-Rank Income Correlation)



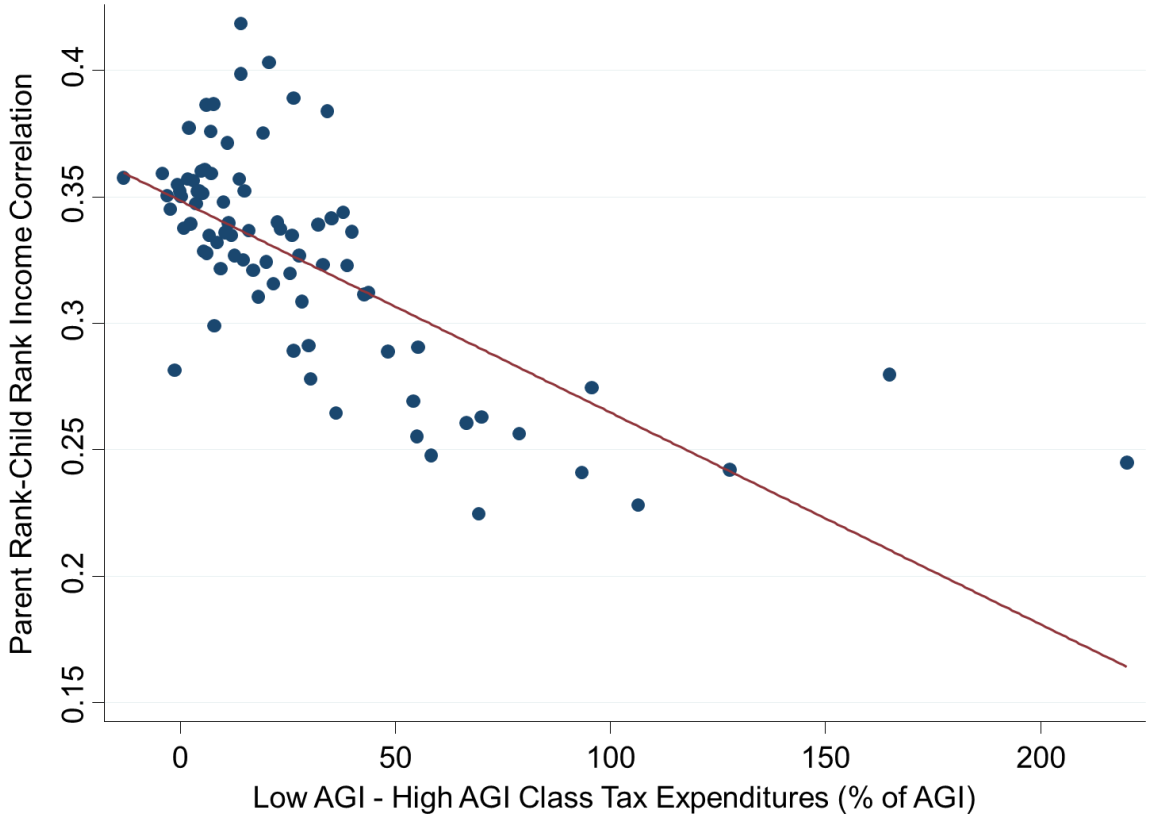
Notes: This figure maps CZ coefficients from OLS regressions of adult children's income rank on their parents' income rank, with rank defined by income centiles within each CZ. Darker areas represent lower intergenerational mobility. See Section 2.2 for details on the construction of local IGE measures.

FIGURE 4
CZ Tax Expenditures and Intergenerational Income Correlation



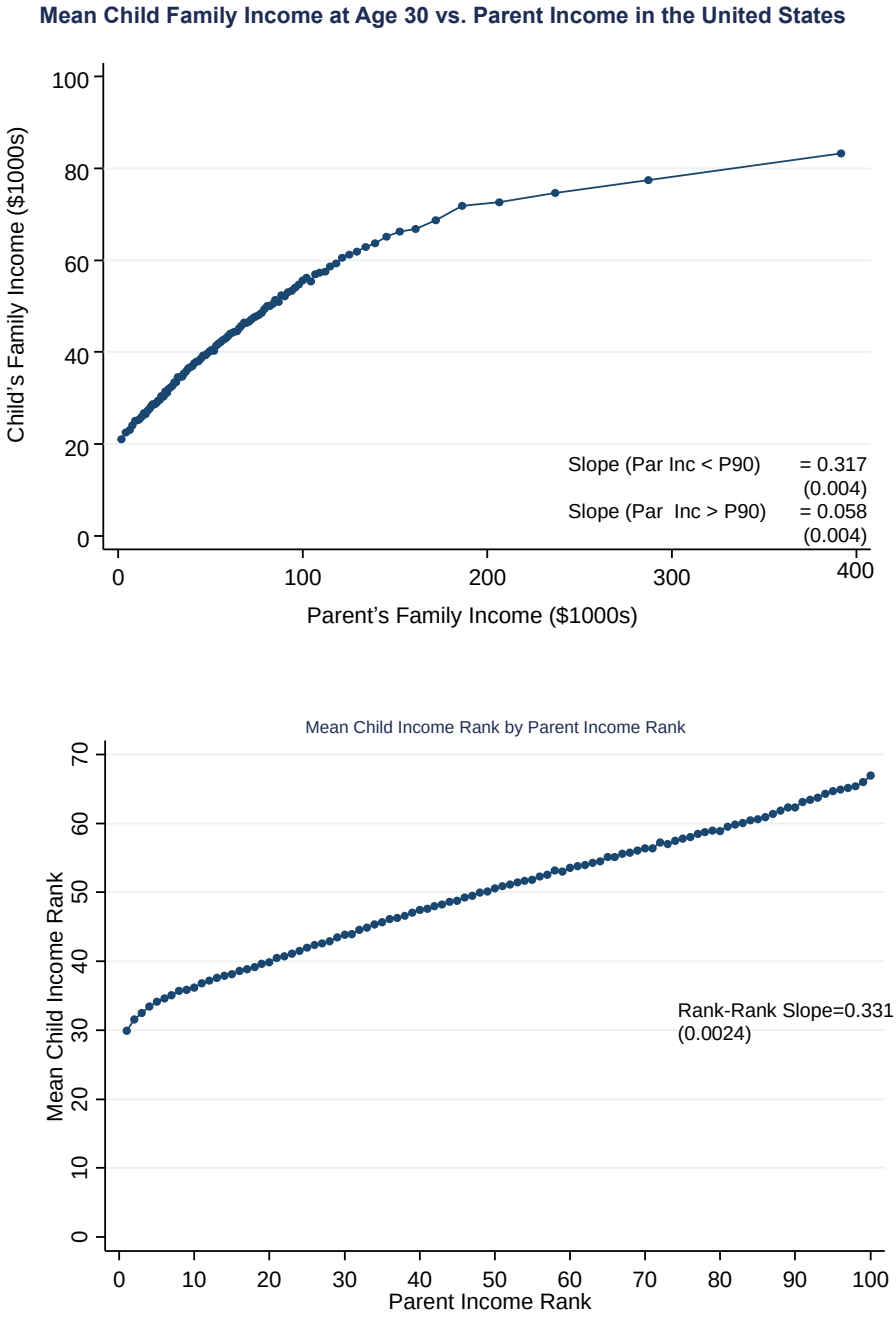
Notes: This figure displays a binned scatterplot of the relationship between CZ aggregate tax expenditures as a percentage of AGI in 2008 and the CZ IGE as measured by the correlation between parent rank income and child rank income. See Section 2.2 for more details on the construction of the tax expenditure and IGE measures. To generate the binned scatterplot, we group CZs into centiles (one-hundred equal-sized bins) on tax expenditures as a percentage of AGI, weighting by CZ population. The dots represent the weighted means of the IGE and tax expenditure measure. The best-fit line is calculated from a regression on the CZ level data.

FIGURE 5
CZ Progressivity of Tax Expenditures and Intergenerational Income Correlation



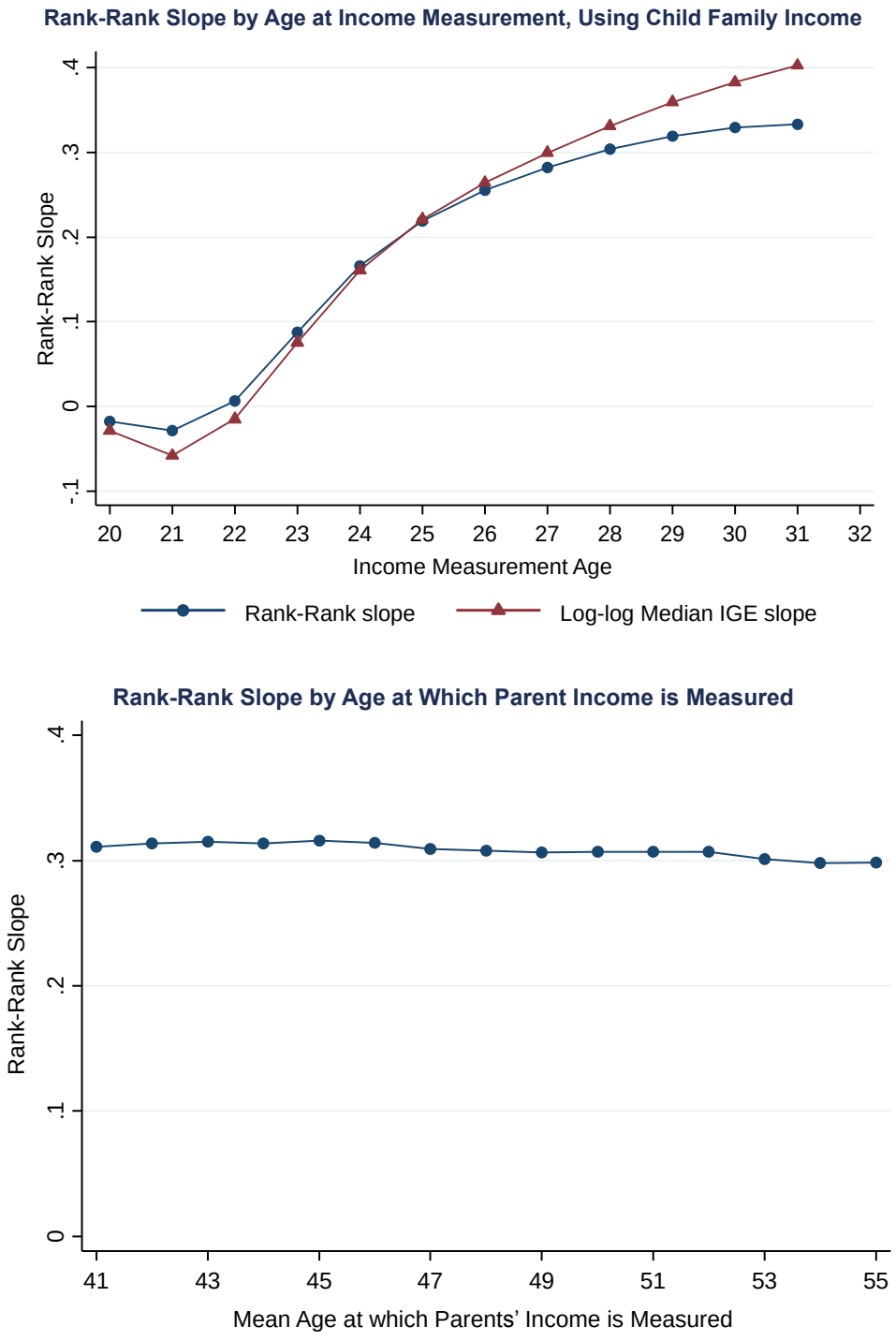
Notes: This figure displays a binned scatterplot of the relationship between progressivity of CZ tax expenditures and IGE as measured by the correlation between parent rank income and child rank income. Eight CZs with over 300% difference in tax expenditures are excluded from the figure and best-fit line. See Section 2.2 for more details on the construction of the tax expenditure and IGE measures. See notes to Figure 4 for further explanation of construction of the binned scatterplot.

APPENDIX FIGURE A1
Child Income vs. Parent Income



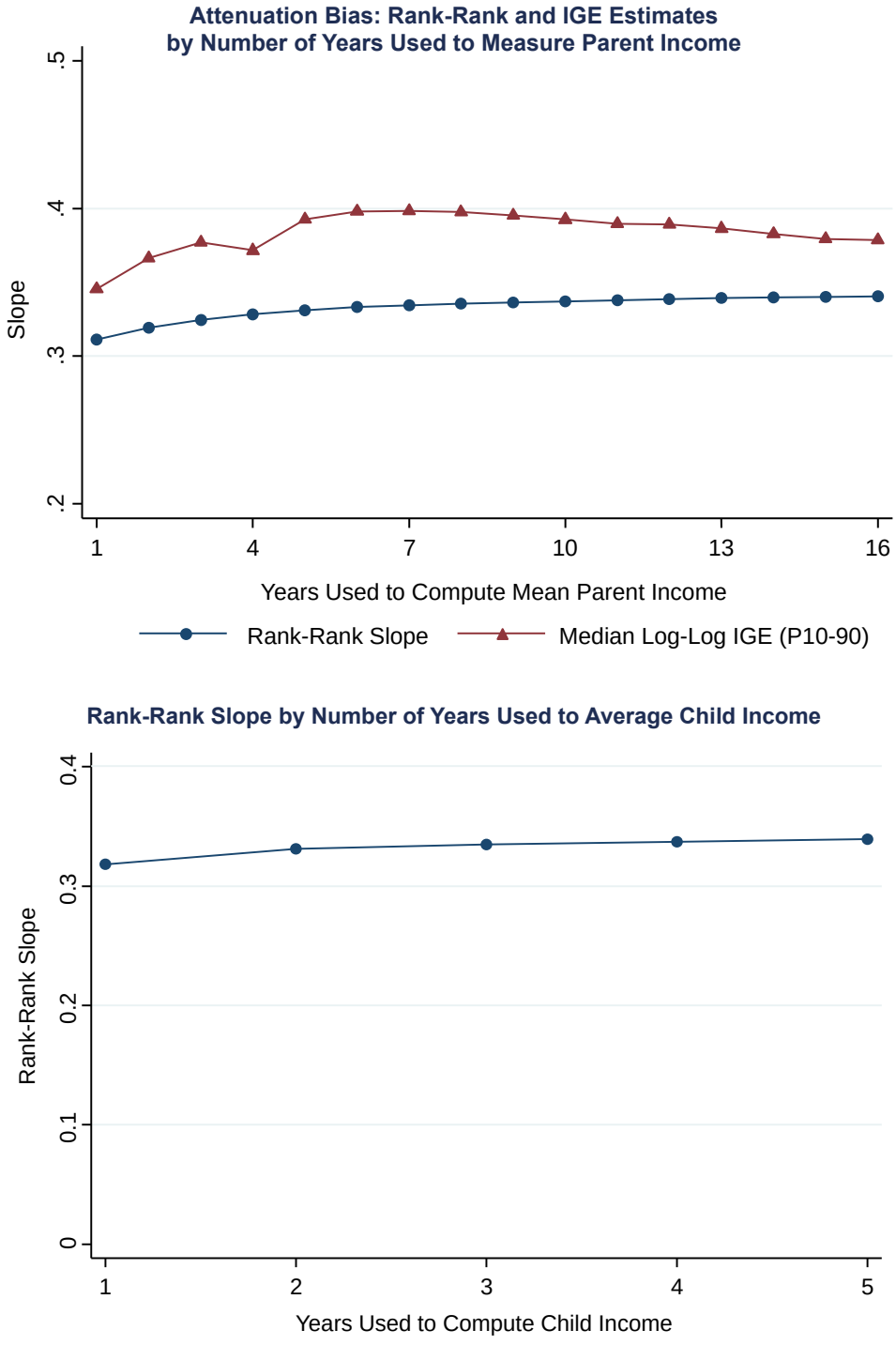
Notes: The top panel divides parents by income percentiles (on the x-axis) and then depicts the mean income of children (in adults). Sample includes all children born in 1980-1981 who are US citizens (as of 2011). All dollar values in the figure are in real 2011 dollars. The bottom panel divides parents by percentiles (on the x-axis) based on their income. Children are ranked from 0 to 1 by earnings as adults. The figure then depicts mean income rank for children by percentile of parent's income.

APPENDIX FIGURE A2:
Robustness of IGE Rank-Rank by Age of Child and Parent



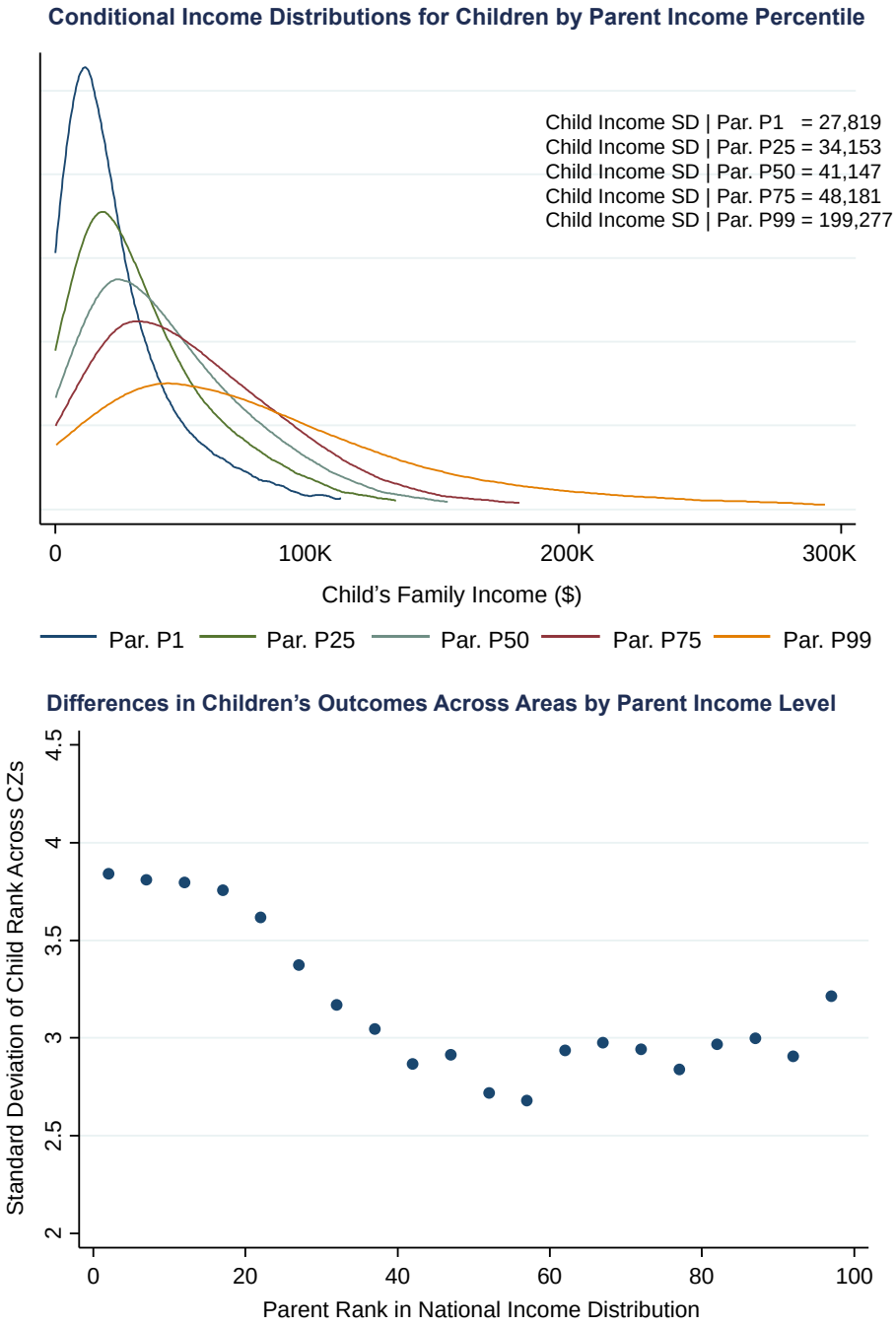
Notes: This top (bottom) panel depicts the rank-rank slope and log-log median IGE slope between parents' income and child income by varying the year at which children (parent) incomes are measured.

APPENDIX FIGURE A3:
Robustness of IGE Rank-Rank by Number of Years Used



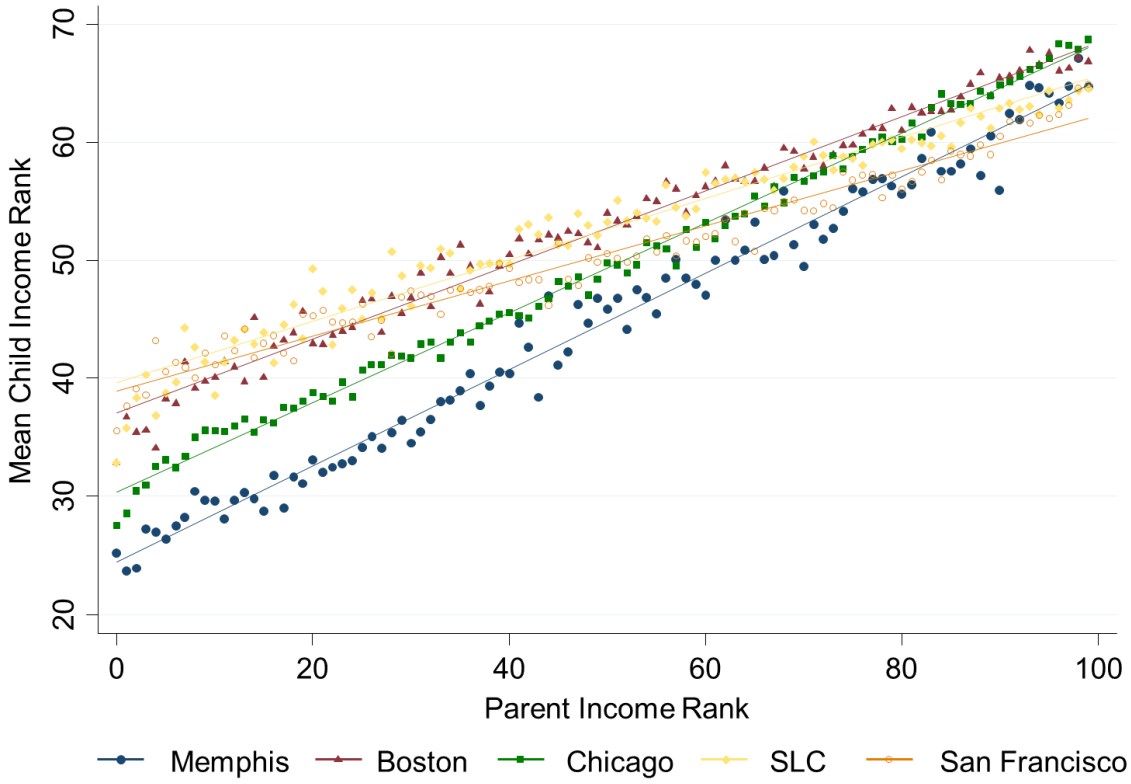
Notes: This figure depicts the rank-rank slope IGE slope between parents' income and child income by varying the number of years used to compute parental income (top panel) and children income (bottom panel).

APPENDIX FIGURE A4
Conditional Children Income Distributions by Parent Income Percentile



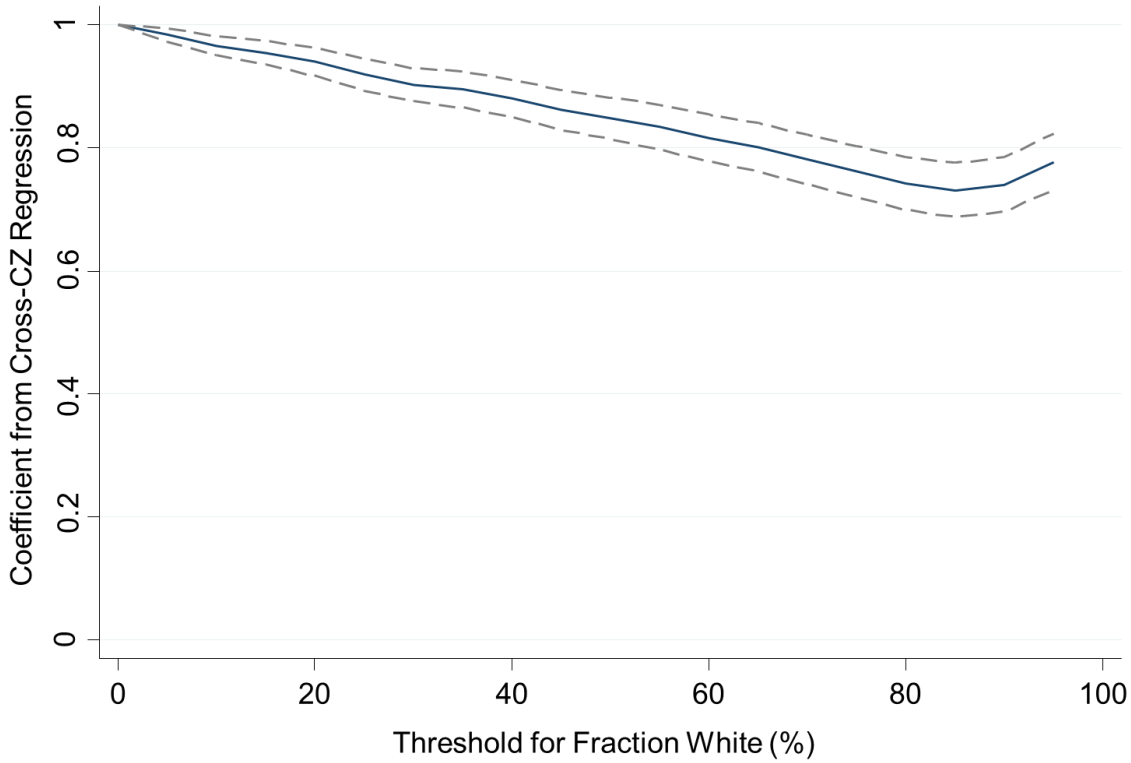
Notes: The top panel depicts the density distributions of children income for various percentiles of the parent distribution. It shows that both the mean and variance of the children income distribution increases with the parents' income percentile. The bottom panel depicts the standard deviation of child rank across CZs.

APPENDIX FIGURE A5
Mean Child Rank vs. Parent Income Centile Rank by Cities



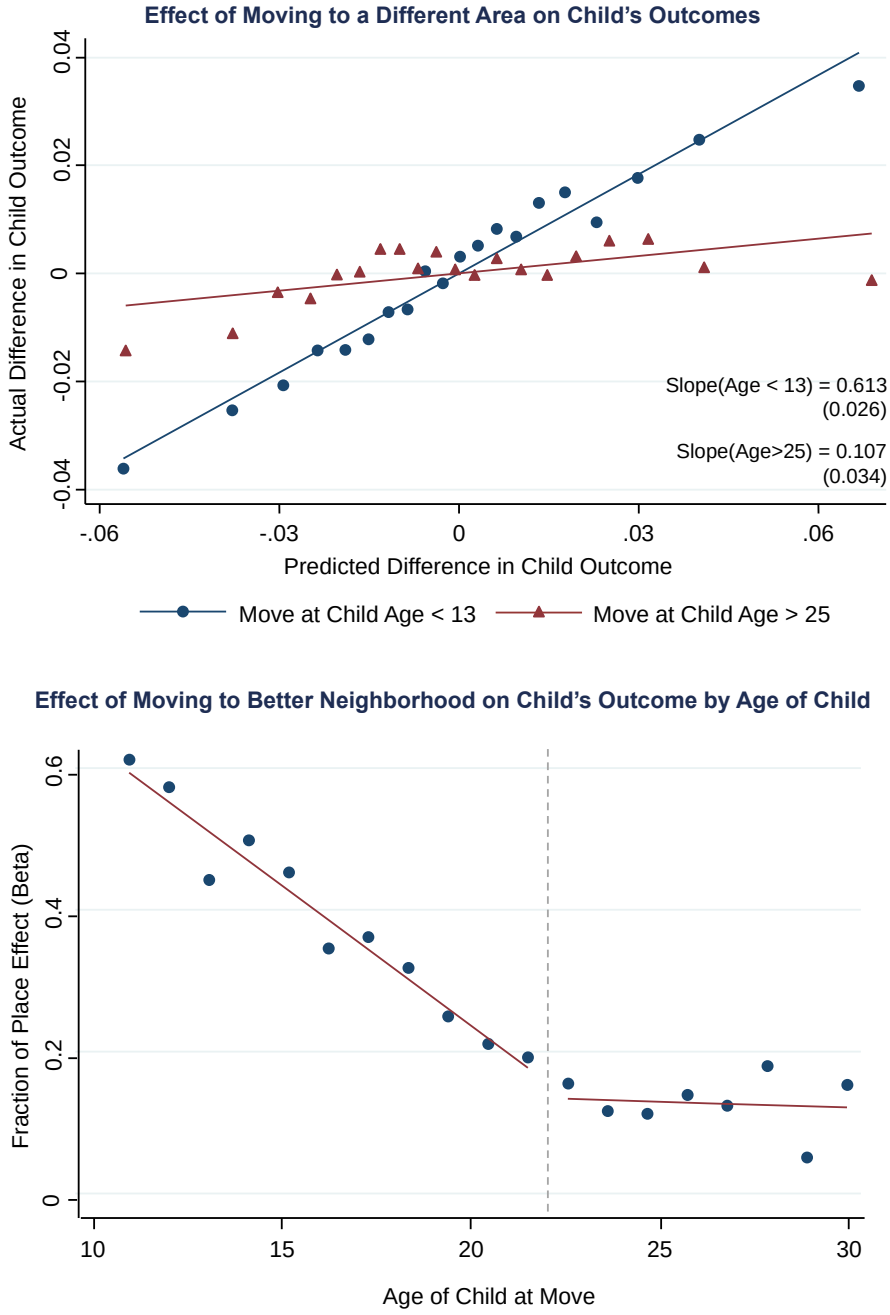
Notes: This figures divides parents by percentiles (on the x-axis) based on their income. The figure then depicts mean rank for children (as adults) for various cities (Memphis, Salt Lake City, San Francisco, Chicago, Boston). City is defined based on the residence of the parent when the child was claimed as dependent in years 1996-2000. Sample includes all children born in 1980-1981 who are US citizens (as of 2011). Parents' income is average F1040 income for years 1996-2000. Children' earnings is average 1040 income for years 2010-2011. All dollar values in the figure are in real 2011 dollars. The figure shows that the link between parent's percentile and children earnings outcomes is roughly with different slopes and levels across cities.

APPENDIX FIGURE A6
White Upward Mobility vs. Overall Upward Mobility
at Varying ZIP-5 Race Thresholds



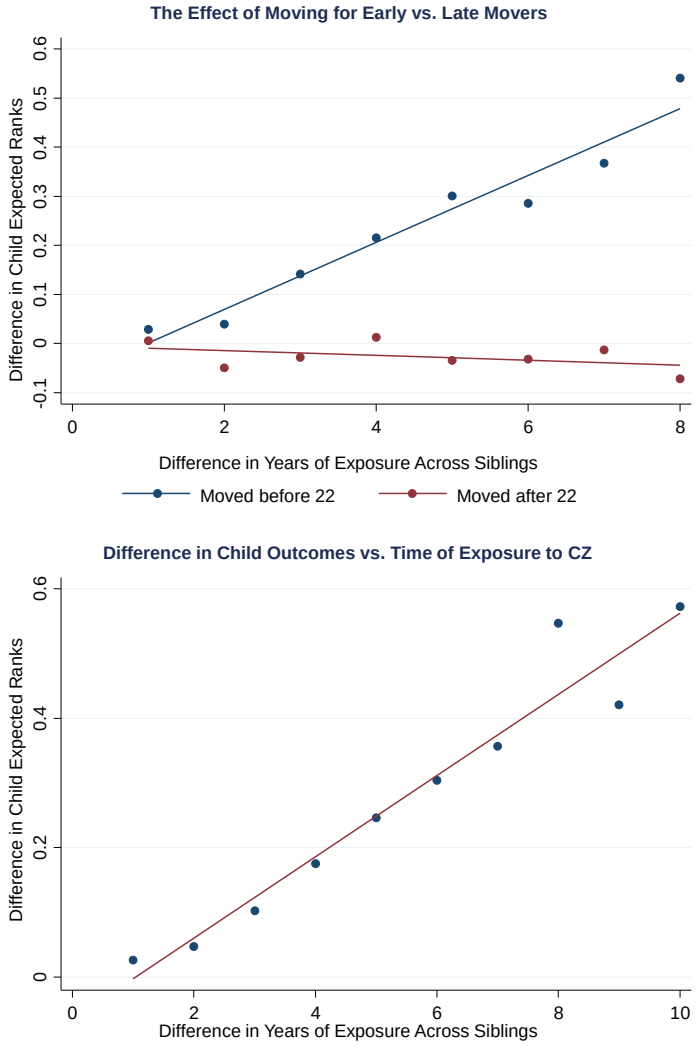
Notes: This figure shows that the correlation between upward mobility CZ coefficients between the main sample and a sub-sample where we remove ZIP-5 with less than a given percentage of white residents (fraction white is obtained from Census data). The percentage varies from 0% to 95%. This graph shows that the correlation remains very strong at all thresholds implying that the geographical pattern we find is not driven by racial composition.

APPENDIX FIGURE A7
Effect of Moving to a Different Area on Child's Outcomes



Notes: The top panel depicts the actual mean child income rank against the expected income rank of the child given the parent income and CZ of residence before the child turned 13 (in blue) and after the child turned 25 (in red). The graph shows that place of residence of parents after the child turns 25 has no predictive power for child rank, suggesting that the effects of places is in part causal. The bottom panel shows the effect of moving to a better city on child outcome by age at which the move takes place.

APPENDIX FIGURE A8
Effect of Moving to a Different Area: Differences by Time of Exposure



Notes: The top panel depicts the effects of moving on early vs. late movers. The bottom panel depicts the difference in child outcomes vs. time of exposure in the CZ.