

Income mobility and government spending in the United States

Arjun Datta¹, Niklas Schmitz²

¹ United World College of South East Asia, Dover, Singapore

² University of Cambridge, Faculty of Economics, Cambridge, United Kingdom

SUMMARY

Often considered the land of opportunity, the United States is experiencing a significant decline in income mobility. Of the factors that have been explored in relation to mobility such as inequality, segregation, quality of schools, and levels of social capital, many are expected to lie within the scope of government expenditure. We explored the hypothesis that higher government spending, especially in areas such as education, is associated with greater levels of mobility. We conducted regressions of two formulations of state-level income mobility on state-level government expenditure. Absolute income mobility explores mobility across the income distribution while upward income mobility focuses on lower-income individuals. We first examined government expenditure on aggregate over the first three decades of an individual's life, before splitting it into components including education and welfare. Our results yielded no significant association between government expenditure and absolute mobility; however, they confirmed a more concrete relationship with upward mobility. A significant relationship exists between elementary education spending and upward mobility which, given related findings in existing literature, could be interpreted as causal. Spending on welfare or public services, on the other hand, suggests no strong link. Our findings imply that states can influence the mobility of low-income individuals through public expenditure, especially on elementary education. Therefore, states where poor upward mobility coexists with low levels of per capita spending on elementary education can hope to improve the outcomes of lower-income individuals by increasing expenditure on elementary education.

INTRODUCTION

Income mobility measures the ability of individuals to make economic progress from one generation to the next (1). It is of central importance to a flourishing economy because of its close links to concepts such as equality and opportunity, key goals in modern societies (2). However, achieving income mobility is more precarious than often believed. A recent study of intergenerational mobility in Florence, Italy showed a high degree of persistence in socioeconomic position within the city across generations, over a period of 700 years (3). The study provided an illustration of the long-term effects that the absence of mobility can have. As a result of this

immobility, the wealth of a child born today in Florence can be determined with a significant degree of accuracy by that of their distant ancestors many centuries past (3). Economic gains have therefore been entrenched within society, leaving individuals with limited autonomy over their future levels of income or achievement.

The United States, on the other hand, is a country that has long been characterized by the American Dream of equal opportunity to all irrespective of their family background. However, modern research has questioned the extent of income mobility within the country and has highlighted a decline in mobility over time, meaning the American Dream of forging a better life for oneself has become increasingly hard to attain (1, 4). A recent study highlights that upward income mobility, or the probability of someone with parents in the bottom quintile of the income distribution reaching the top quintile, is only 7.5% in the United States, compared with 11.7% in Denmark and 13.4% in Canada (1). Another study, using a different metric termed absolute income mobility, which measures the fraction of children who in their adulthood earn more than their parents did after adjusting for inflation, determined that levels of mobility have fallen steadily in the United States since the 1940s (4). While over 90% of children born in 1940 earned more as thirty-year-old adults than their parents did, just over 50% of the 1984 birth cohort managed to do better than their parents (4).

While absolute income mobility has been falling over time on aggregate within the United States, there is significant variability in income mobility across its regions. The Opportunity Atlas dataset, constructed by a team of researchers from Harvard University and others, shows that there is significant variation in mobility across states (5, 6). In terms of the absolute income mobility metric, the proportion of children who earn more than their parents when they are thirty years old is the highest in the District of Columbia (66%) and South Dakota (62%), but is the lowest in Nevada (40%) and Alaska (38%). When mobility is measured in terms of the upward income mobility metric, the probability of a child with parents in the bottom quintile of the income distribution reaching the top quintile is the highest for North Dakota (19%), Wyoming (16%), and Alaska (13%), but is lowest (5% or less) in Alabama, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee. The two mobility measures yield very different relative positions for Alaska; while the state has the lowest proportion of children earning more than their parents, children of low-income parents in the state have better outcomes than in other states. This suggests that the two measures of mobility provide different perspectives on mobility. Overall, the geographic variation in income mobility for both our metrics allows for an exploration of factors that contribute to this variation within the United States.

A number of factors have been identified to explain the geographical variation in income mobility in the United States including differences across regions in income inequality, racial and income segregation, quality of schools, and levels of social capital (1, 7). Existing research has highlighted that public spending can influence many of these factors (2, 8, 9). Solon suggested that progressive public programs can significantly stimulate intergenerational mobility, especially for low-income individuals (8). In doing so, he emphasized the importance of targeted expenditure for the poor, specifically in relation to education and its accessibility. This emphasis ties into the distinction made by Korpi and Palme between universal and targeted forms of public spending and their differential effects on poverty and inequality (9). Korpi and Palme, however, suggested the opposite, positing universal forms of public spending to be most beneficial to the outcomes of the poor (9). They postulated that this was because such schemes are able to bring all social classes into a "coalition" and hence lead to larger redistributive spending (9). In contrast, more targeted schemes have less of an impact on inequality because the spending on such schemes is smaller, potentially due to less support from upper and middle classes. This implies that government spending on universal social services, such as education and transport, are likely to have more of an impact on social equity and mobility primarily because they will tend to be larger and more significant than more targeted schemes which might be too small to have a material social impact.

In a paper on income inequality and mobility, Corak suggests that public policy has a very consequential role, either softening or exacerbating existing levels of inequality (2). Referencing the United States, he singles it out as a country whose public policy seems only to increase disparities within the country. He highlights that while the US had one of the highest levels of education spending among developed countries, this was largely driven by spending on tertiary (or post-secondary) education – spending on tertiary education was three times that on primary education (2). In this manner higher education is prioritized, allowing for the more advantaged to benefit to a greater degree. In contrast, Corak places Canada as an example of a country whose policy and spending mitigated the degree of economic inequality within a society (2). Outcomes in Canada on a variety of different metrics from social to economic well-being are less dependent on parental or family attributes. As a result of programs such as universal provision of healthcare and policies such as extended paid parental leave, individuals are less susceptible to shocks that might compound their already precarious situation. Not only does this effect reduce inequality, but also promote mobility through greater protection against downward shocks. The paper therefore uses the contrast between the two countries to draw out the important role the government has in both issues of inequality and mobility (2).

Given the existing literature on the links between public policy and intergenerational mobility, we set out to test the hypothesis that the level as well as the composition of government spending has a significant impact on mobility within the United States (2, 8, 9). Since the existing research highlights a link between access to education and mobility, it is likely that higher public spending on primary education, given its greater accessibility, has a material impact on

improving mobility (2, 8). We also compared public spending on universal services such as healthcare, utilities, or transport and targeted spending on welfare in their relationship with mobility, a subject explored by researchers on redistribution and equality (9).

To test our hypothesis that government spending is positively associated with income mobility, we explored how differences in state-level government spending affect state-level income mobility and analyzed the relationship between spending and two alternate formulations of mobility. The first is a broader metric that we term 'absolute income mobility', measuring the proportion of children who at 30 years of age earn more than their parents did. The other metric measures the probability of children with parents from the bottom quintile of the income distribution reaching the top quintile, which we refer to as 'upward income mobility'. We explored these relationships firstly for total levels of per capita state-level government spending, and then for four key components of this spending: elementary education, higher education, welfare, and public services. Together, these constitute around two-thirds of total state-level government spending in the United States (10).

Our findings suggest that the relationship between government spending and income mobility depends on the metric used for mobility. While government spending did not have a significant correlation with the more broad-based absolute income mobility measure, it was associated with positive outcomes for children of low-income parents. In particular, it was government spending on elementary education that had the most significant impact on adulthood incomes of children growing up in low-income families. On the other hand, neither welfare spending nor spending on public services such as healthcare, utilities, or transport was material to the income mobility outcomes for low-income families.

Overall, our findings imply that a significant factor for the variation in state-level upward income mobility in the United States is the variation in levels of state-level government spending on elementary education. Our results suggest that states with low levels of upward mobility could improve the outcomes of lower-income individuals by increasing spending on elementary education.

RESULTS

To study the relationship of government spending with income mobility, we first explored how total levels of per-capita state-level government spending affect state-level income mobility, and thereafter, we assessed the impact of four key components of this spending: elementary education, higher education, welfare, and public services. We considered two measures of income mobility – absolute income mobility and upward income mobility – which have a low degree of correlation ($R^2=0.079$), implying that the two measures provide different perspectives on mobility (Figure 1).

Relation between mobility and total levels of government spending

Using Ordinary Least Squares regression for the absolute income mobility of the 1980 cohort in each state over the average annual per capita state-level government spending for the 1981-2010 period, we got an almost flat relationship with little statistical significance ($t\text{-stat} = -0.40$, $p > 0.1$, $R^2 =$

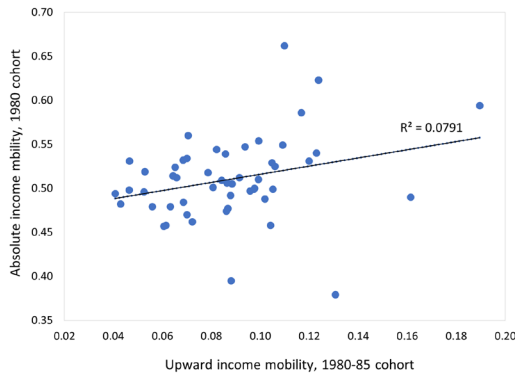


Figure 1. Low correlation between absolute income mobility and upward income mobility across US states suggests that the two measures of mobility provide different perspectives on income mobility (N=51). Absolute income mobility for the 1980 birth cohort vs. upward income mobility for the 1980-85 birth cohort for the 50 states and the District of Columbia in the United States. Plotted line represents line of best fit. Datasets sourced from the Opportunity Insights team at Harvard University (5, 6).

0.003) (Figure 2).

Absolute mobility for the 1980 cohort, however, was highly correlated with that for the 1970 cohort ($R^2 = 0.632$), suggesting a possible persistence of state-specific factors, such as culture or entrenched racial and economic segregation, affecting mobility (Figure 3). Hence, to control for state-specific factors, we also examined the relationship between the change in absolute mobility for a state from 1970 to 1980 and its state-level government spending during the 2001-2010 decade alone. This is as expenditure in the previous decades could impact the earnings for both decadal cohorts at age 30 therefore not allowing for the observance of a change. Expenditure in the third decade, however, would have occurred after mobility for the 1970 cohort was measured but could still impact the measurement for the 1980 cohort. This regression yielded a positive and significant relationship between government spending and the change in mobility for a state (Figure 4). For every \$1,000 increase in annual spending per capita, there was an increase of 0.45 percent in absolute mobility (t -stat = 3.17, $p < 0.01$, $R^2 = 0.193$). The relationship, however, was driven by the presence of two outliers for government spending, the District of Columbia (DC) and Alaska, both of which had per capita spending levels that were 3 standard deviations higher than the average. Once the outliers were removed, the relationship was no longer significant (t -stat = 0.63, $p > 0.1$, $R^2 = 0.010$). While the results were not robust to the exclusion of outliers, an alternate explanation could be that a meaningful relation between government spending and absolute mobility only emerges for large changes in government spending.

When regressing upward mobility for the 1980-85 cohort over government spending during 1981–2010, a much stronger and significant positive relationship emerged (Figure 5). There was an increase of 0.42 percent in upward mobility for children of bottom quintile parents for every \$1,000 increase in annual spending per capita (t -stat = 2.96, $p < 0.01$, $R^2 = 0.152$). These results were robust and withstood the removal of outliers in government spending, DC and Alaska. The relationship actually became stronger in terms of

coefficient size upon this removal. There was an increase of 0.86% in upward mobility for every \$1000 increase in annual spending per capita (t -stat = 2.88, $p < 0.01$, $R^2 = 0.150$). We were, however, unable to control for state-specific factors due to a lack of data on upward mobility for previous cohorts.

Relation between mobility and components of government spending

We then analyzed the relationship of different components of government expenditure to both versions of our mobility metrics. We examined four key components of government spending during the 1981-2010 period: elementary education, higher education, welfare, and public services. We measured elementary education over the period 1981-1995 to reflect the fact that elementary education spending was only relevant to the first fifteen years of the life of the 1980 cohort, and similarly we measured higher education spending over the 1996-2005 period since this was relevant to the years when the cohort was 16–25 years old. Spending on welfare and on public services, we assumed, was relevant for all three decades.

The multivariate regression of these expenditure components against absolute income mobility for the 1980 cohort yielded results that were not significant after the removal of outliers. Therefore, there does not seem to be a significant relationship between these components of spending and absolute income mobility. As a sanity check for our results, we controlled for state-specific factors and regressed the change in absolute mobility from 1970 to 1980 on the four government expenditure components. None of the expenditure components has a significant impact on the change in mobility, and this result was unchanged even after the removal of the two spending outliers.

In the multivariate regression of the components of government spending against upward mobility for the 1980-85 birth cohort, only elementary education expenditure had a significant positive relation with upward mobility, with a 3.0% increase in upward mobility for every \$1,000 increase

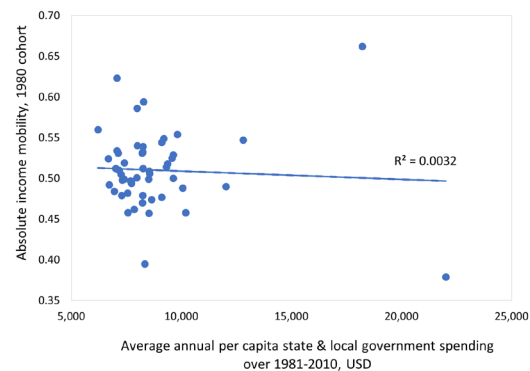


Figure 2. Almost flat relationship between absolute income mobility of 1980 cohort and per capita state-level government spending (N=51). Absolute income mobility for the 1980 birth cohort vs. average annual per capita state and local government spending over 1981-2010 in 2020 USD for the 50 states and the District of Columbia in the United States. Plotted line represents line of best fit. Dataset for income mobility sourced from the Opportunity Insights team at Harvard University (5) and that for state and local government spending from the Urban-Brookings Tax Policy Center (10).

in annual spending per capita (t -stat = 2.40, $p < 0.05$, $R^2 = 0.282$). It should be noted that the results for elementary education demonstrated a significant degree of robustness with removal of the two spending outliers of DC and Alaska resulting in a stronger and more significant relationship with upward mobility. This resulted in an increase of 5.8% in upward mobility for every \$1,000 increase in annual state spending per capita (t -stat = 3.45, $p < 0.01$, $R^2 = 0.325$).

Overall, our results imply that a key factor for the geographical variation in upward income mobility is the difference in levels of government spending on elementary education.

DISCUSSION

Our results suggest that state-level government expenditure does not have a bearing on absolute income mobility, the measure of mobility that considers the potential for income improvements across the entire income distribution. Any relationships that did appear to emerge were quickly diminished upon the removal of outliers. Given its consideration of mobility across the entire income distribution, absolute mobility is likely more closely related to general economic growth and, by extension, government spending directed toward economic growth. Such expenditure, however, may not fit clearly within the components identified in this study, and as such might not have been made explicit.

On the other hand, state-level government expenditure did have a strong positive relation with upward income mobility, the measure that specifically examines outcomes of low-income individuals. The strong relationship of government expenditure with upward mobility along with the absence of a material relationship with absolute mobility suggests that state expenditure might be focused on areas primarily helping the more disadvantaged. It would also imply the success of government expenditure in improving the outcomes of those in need.

Upon exploring the components of government expenditure, our results indicated a strong positive association

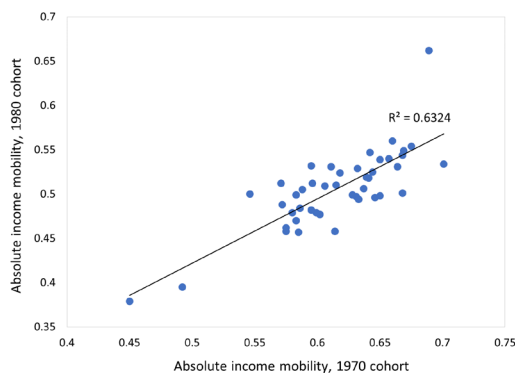


Figure 3. High correlation between absolute income mobility of 1980 cohort and 1970 cohort for US states indicates a possible persistence of state-specific factors affecting mobility (N=44). Absolute income mobility for the 1980 birth cohort vs. absolute income mobility for the 1970 birth cohort for 43 states and the District of Columbia in the United States (income mobility data not available for the 1970 cohort for 7 states). Plotted line represents line of best fit. Dataset sourced from the Opportunity Insights team at Harvard University (5).

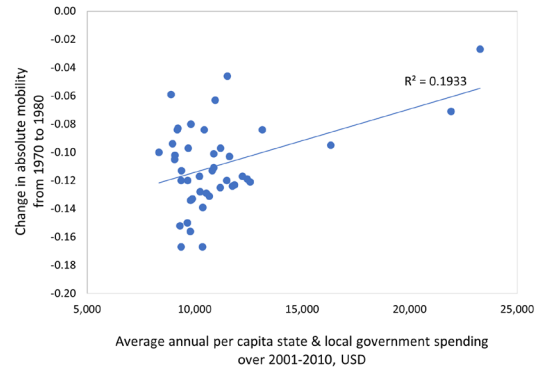


Figure 4. Positive relation between change in absolute mobility from 1970 to 1980 and per capita state-level government spending (N=44). Change in absolute income mobility from the 1970 birth cohort to the 1980 birth cohort vs. average annual per capita state and local government spending over 2001-2010 in 2020 USD for 43 states and the District of Columbia in the United States (income mobility data not available for the 1970 cohort for 7 states). Plotted line represents line of best fit. Dataset for income mobility sourced from the Opportunity Insights team at Harvard University (5) and that for state and local government spending from the Urban-Brookings Tax Policy Center (10).

between spending on elementary education and upward income mobility. Given the existing literature establishing the importance of elementary education in improving expanding access to education, it seems reasonable to suggest a causal relationship driven by greater access to high-quality elementary education (2). This would motivate the recommendation that states like Tennessee, Alabama, and Mississippi, which experience low upward income mobility and also have low levels of per capita spending on elementary education, could improve the outcomes of low-income individuals by spending more on elementary education. Furthermore, the potential importance of access to education in improving upward mobility might also explain the relative lack of a significant relationship it has with higher education. Elementary education is often referred to as a more accessible form of education than higher education due to both its lower financial costs and lower opportunity costs, with barriers to higher education encompassing both the higher fees and the requirement for youth to sacrifice a potential source of income in the form of work. Corak even posited the possibility of greater spending on higher education being detrimental to the outcomes of those with lower incomes, though such a claim was not supported by our results (2).

However, the strong relationship between elementary education and upward mobility suggests the possibility of improving returns on higher education spending by better replicating aspects of elementary education spending. If increasing the accessibility of education was the channel through which elementary education spending was influencing upward mobility, states could hope to modify higher education spending to increase its success in this respect by focusing on aspects that would expand access. A possible policy measure might be to incorporate specific outcome metrics for public spending on higher education that measure whether the spending is being directed in ways that can enhance mobility. While standard outcome measures

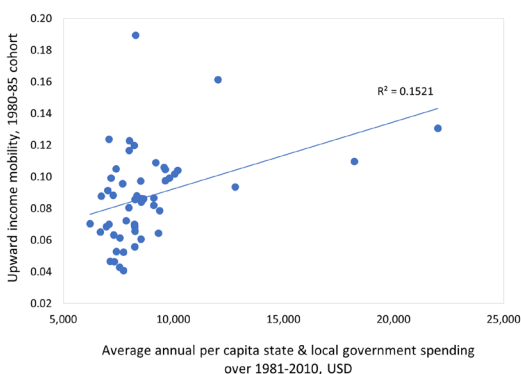


Figure 5. Positive relation between upward income mobility and per capita state-level government spending (N=51). Upward income mobility for the 1980-85 birth cohort vs. average annual per capita state and local government spending over 1981-2010 in 2020 USD for the 50 states and the District of Columbia in the United States. Plotted line represents line of best fit. Dataset for income mobility sourced from the Opportunity Insights team at Harvard University (6) and that for state and local government spending from the Urban-Brookings Tax Policy Center (10).

such as impacts on standardized testing scores should not be abandoned, new metrics based on expanding access to education should also be incorporated. To suit these new metrics, greater proportions of higher education spending could focus on aids or grants. Another measure might be to focus more on funding community colleges or vocational training centers rather than prestigious state institutions. In this manner, opportunities become more accessible, and discrepancies in higher education can be reduced.

Finally, an interesting result we obtained was the absence of a significant relationship between welfare spending and upward mobility. This was surprising given that welfare spending is targeted towards lower-income individuals and yet seems to display no real relationship with positive outcomes. A possible explanation arises from the finding of Korpi and Palme that targeted spending schemes may have relatively small effects due to their inability to gather broad support and therefore size (9). Although our paper examined the quantity of welfare spending and our results should in theory account for this lower general level of spending, it is possible that welfare spending ought to be of a certain magnitude to show concrete effects on upward mobility. If so, it might be the low levels of per capita welfare spending within the United States that obscure a relationship between such spending and upward mobility. Social spending as a percent of gross domestic product (GDP) is relatively low in the United States compared to other developed countries, and only Canada has a lower level among the G-7 countries (11). The idea that the magnitude of spending is relevant would need to be confirmed by a cross-country regression on upward mobility and welfare spending, which would include greater variation in quantities of welfare spending (as a percent of GDP). Furthermore, our results did not support the idea that universal schemes may have more substantial benefits for low-income individuals than targeted schemes. Universal forms of spending, represented by expenditure on public services, also had a non-significant relationship to upward mobility within our research.

A key limitation of our research was that the analysis

focused on the impact of the quantity of public expenditure – as opposed to the quality of spending. Furthermore, the quantities we examined were broader categories incorporating many distinct parts. While these limitations may have obstructed us from establishing a clearer link between public spending and income mobility, this focus took into account the natural inefficiencies that come with public spending. In this manner, the results captured the potential effects that government spending may actually have on mobility. However, the likelihood that different states spend to differing levels of efficiency prevented clearer relationships to emerge between spending and mobility.

Another issue to consider is that government spending was not adjusted for state-level purchasing power. Spending values may not be fully comparable across states, as states differ in their costs of living. According to the Bureau of Economic Analysis, the purchasing power of 1 USD in 2019 varied from 0.84 USD in Hawaii to 1.18 USD in Arkansas (12).

Lastly, an important limitation is that our paper explores correlations between public spending and income mobility but does not provide direct insights into causality. Further research would need to control for other factors that could have a bearing on mobility. Such factors would include those already identified in prior research such as income segregation, inequality, quality of schools, and levels of social capital (1, 7). Another control could be the political party in power since, for a given level of expenditure, policies of Democrat- and Republican-led governments might be targeted differently across the income distribution. The inclusion of these factors could also help in improving the explanatory power (R²) of the models.

In summary, we took a closer look at the relationship between state-level government expenditure and income mobility in the United States. Our results showed little relation between government spending and absolute income mobility, which measures income mobility across the entire income distribution. A more concrete relationship emerged when we considered upward mobility, which measures the probability of individuals from low-income backgrounds to move up the income distribution. We also considered the main components of government spending, including education and welfare. We found a significant association between state spending on elementary education (but not for higher education) and upward mobility. There was little to no relation between welfare spending and income mobility in our sample.

Our results suggest that while government spending may not significantly influence absolute mobility, it may be effective in promoting upward mobility. Furthermore, in the United States, a key factor for the variation in upward income mobility among the states seems to be the difference in levels of elementary education spending. Given the existing research highlighting the role that early education plays in expanding access to educational opportunities, it seems reasonable to assume that this correlation implies a causal relationship. Overall, our findings imply that states with low levels of upward income mobility could improve the outcomes of low-income individuals by increasing expenditure on elementary education.

MATERIALS AND METHODS

We defined government spending as the sum of state and local government spending. This was measured in per capita

real terms in 2020 USD (to facilitate comparisons of spending over time) and was sourced from the State and Local Finance Initiative of the Urban-Brookings Tax Policy Center (10). The components of spending examined in this paper are combinations of categories within this dataset and consist of spending on elementary education, higher education, welfare, and public services. Elementary education spending is defined as elementary education direct expenditure (item E027 in the database) and higher education spending is total higher education direct expenditure (E030). Welfare spending is a combination of public welfare direct expenditure (E090) and unemployment compensation total expenditure (E137). Public services spending comprises health and hospital direct expenditure (E052), total utilities total expenditure (E110), sanitation direct expenditure (E096), air transport direct expenditure (E020), total highways direct expenditure (E065), parking direct expenditure (E083), and water transport direct expenditure (E103).

We used two measures of state-level income mobility, absolute income mobility and upward income mobility, both of which were sourced from the datasets provided by the Opportunity Insights team at Harvard University (5, 6). We measured absolute mobility for the 1980 birth cohort of the Opportunity Atlas data (5). Upward mobility was measured for the 1980–85 birth cohort, as this sample was distinct from that for absolute mobility (6).

We conducted Ordinary Least Squares (OLS) regression, estimated with constant terms using Microsoft Excel's Analysis ToolPak, to explore the relationship between state spending and our two measures of income mobility. We first regressed both our income mobility measures (absolute mobility for the 1980 cohort, and upward mobility for the 1980–85 cohort) over annual per capita state spending in USD over 1981–2010 (representing the first three decades in the life of the cohort). To test the null hypothesis that a regression coefficient is zero, we used a two-sided t-test with t-statistics calculated assuming errors have constant variance, and considered *p*-values below 0.1 to be significant. To control for state-specific factors affecting mobility, we also regressed the change in mobility within a state from 1970 to 1980 over the state spending during 2001–2010. We then conducted multivariate regressions of both our mobility measures over the above-mentioned components of state spending to analyze the effects of these components on income mobility. We conducted all regressions with and without outliers (DC and Alaska were the two outliers with per capita government spending that were 3 standard deviations higher than the average) to assess the robustness of our findings.

Received: February 3, 2023

Accepted: April 17, 2023

Published: November 4, 2023

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