Persistent Inequality: Mobility and Intergenerational Redistribution*

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September 9, 2022

Abstract

We approximate inequality as a dynamic problem where parents make decisions about how much and how to invest in the economic opportunities of the next generation. Theoretically, we analyze the degree to which sclerosis of local labor markets (lack of mobility) plays a role in the elder generation's choice and reinforces the inclination by high and middle income households not to support public investment in human capital formation, thereby reinforcing inequality across generations. We evaluate this feedback loop using a wide range of USA and European micro-data.

*Paper prepared to be presented at APSA 2022. Previous versions presented at SCHOOLPOL conference on politics of education, Nuffield College, December 2019; Duke Conference on Social Mobility and Social Mobility Working Group, Duke University, and the IPEG-UPF workshop, June 11 2015, and the Council of European Studies Meeting, Paris,and at CES Lisbon June 2022. We thank the audiences in these events for their feedback and suggestions. This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, grant agreement number 724949. The ERC project code for this project is WEALTHPOL.

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1 Inequality, Mobility, and Politics

The last two and a half decades have witnessed an unprecedented increase of the scholarly attention to the causes and consequences of economic inequality, and, in lesser depth, to the role various political factors play in it.[1] Relatively speaking, and in large part due to the lack of readily available data, scholarly attention to the role political choices play in explaining the patterns of intergenerational income mobility has been much scanter. To be precise amidst the cumulative streams of work on intergenerational mobility, political analysis has been at best indirect. Along with a recent stream of research focusing on genetic determinants of life chances(Bjorklund et al., 2005), dominant approaches decompose persistence into the relationship between parental assets and children's characteristics, such as educational attaintments, health, occupation,family structures, connections (or what Becker called very early "luck" (Becker and Tomes, 1979)) or financial burdens/opportunitites for investment(Bowles, Gintis and Groves, 2009; Smeeding, Erikson and Jäntti, 2011) And yet, a number of recent findings suggest this linkage as a territory worth exploring for scholars interested in political institutions and outcomes, for both substantive and analytical reasons.

Milton Friedman famously claimed that the focus on short term income inequality was misguided because inequality is a necessary cost of the efficient working of markets, which will bring about a fair allocation of resources in society in the long run (Friedman and Friedman, 1990). In his view, inequality and mobility were deeply intertwined with the former creating the necessary incentives for economic actors to pursue the latter. In any *land of opportunity*, free markets facilitate income mobility according to effort and a fair distributive outcomes would emerge as a result. However effective as a moral compass or political mobilization tool, we know this tale to be at odds with the available facts. In Friedman's world, inequality creates incentives for mobility, and the latter occurs primarily when market are unrestrained

[1] Among many other works in economics, sociology and political science see, for example, Atkinson (2015); Bartels (2009); Kenworthy and Pontusson (2005); Piketty (2014); Smeeding (2006)

by the state. Accordingly, mobility should be at its peak in societies with large levels of inequality and low levels of state intervention. However, the cross-national record does not appear to bear out Friedman's conjecture. Instead, higher economic inequality is associated with *lower* economic mobility at the national level a finding Alan Krueger christened the 'Great Gatsby curve' (Krueger, 2012).

Instead, both economic inequality and economic mobility appear to be drive at least in part, by different policy choices made across countries. Figure 1 presents cross-national evidence on these issues, using data on income inequality (Gini coefficient for post-tax and transfers income for the working age population around 2010), the income elasticity of children's income on that of their parents (Corak 2013)[2], and the relative effort governments make on current consumption and long-term investment as a percentage of GDP.

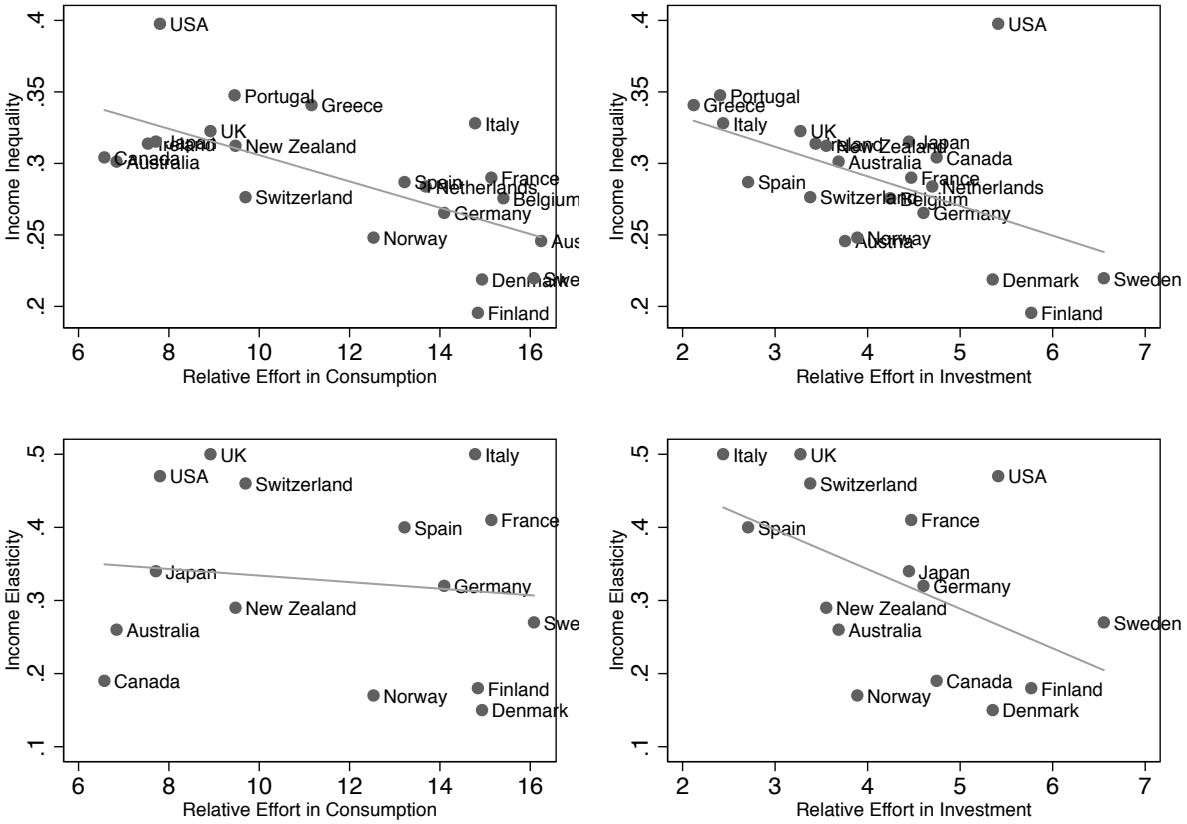
Social investment refers to policies that contribute to increase the overall productivity of the economy, and includes effort in education, research and development, childcare, activation and public infrastructure. Social consumption refers to policies devoted to boost citizens' ability to purchase goods and services in the short run, such as unemployment insurance, pensions, and redistributive transfers.[3] The balance between these two sets of

[2]A higher elasticity implies a higher impact of parents' income on that of their children. A lower elasticity implies that children income is less dependent on that of their parents, presumably reflecting an equalization of economic opportunities.

[3]The distinction between consumption- and investment-oriented policies links back to different growth strategies. An innovation-based strategy builds on skills upgrading in the medium run and aspires to increase productivity levels and to sustain growth through leading edge innovations (Aghion and Howitt, 2006). In contrast, for countries behind the technology frontier growth occurs primarily via capital investments, the importing of technologies developed elsewhere, and consumption oriented policies aimed at sustaining high levels of aggregate demand (Acemoglu, Aghion and Zilibotti, 2006). Accordingly we define "investment" not only in relation to social policy, but more widely as public expenditures that increase the productivity of the economy overall and of labor and capital in particular. The term 'investment" refers to the future orientation of these expenditures in the fields of education, research and development, child care, activation, and public infrastructure. On the other hand, we define "consumption" as a function of both measures of regulatory protectionism (such as employment protection) and social transfers to beneficiaries that use them in order to cover current needs and demands. For further elaboration, see Beramendi et al. (2015). More narrowly defined, the distinction also plays a central role in the more recent comparative welfare states literature; See (Bonoli and Natali (2012); Esping-Andersen (1999); Gingrich and Ansell (2015); Hemerijck (2012); Morel, Palier and Palme (2012)).

policy instruments provides an indicator of the willingness by governments to sacrifice current consumption for future prosperity (Beramendi et al., 2015).

Figure 1: Inequality and Political Choice



Among the most prosperous democracies on earth, there is quite a bit of variation in terms of the trade-off between current consumption and future prosperity. In terms of economic inequality (post tax and transfer) we see higher social consumption *and* higher social investment associated with lower inequality, although in the latter case the USA is a clear outlier. The same relationship does not hold up as cleanly with economic mobility, (negatively) proxied here by the intergenerational elasticity of income. Here we see that social consumption appears unrelated at the national level to economic mobility but social

investment does appear to increase economic mobility. Again the USA is an outlier here though somewhat less.

The Scandinavian countries are able to achieve at once high levels of equality and social mobility (as represented by a lower elasticity of children to parents' income) and spend large amounts of resources in both universalistic transfer programs and progressive investments via public services. The former protect against economic downturns. The latter equalize future economic opportunity. Where spending on both is low, as in the UK and Switzerland, economic mobility tends to be low and economic inequality relatively high.

Elsewhere countries fall into two groups - those that are relatively high consumption and low investment spenders and those that are relatively high investment and low consumption spenders. The former group includes a number of the Southern European countries, particularly Italy and Spain, producing moderately high post-tax income inequality and very low social mobility. By contrast the group that spend low amounts on on consumption but high amounts on investment have mixed results - Canada has quite high income inequality abut also high mobility, whereas the USA has both high inequality and low mobility. In part this may reflect the fact that access to investment policies can be quite regressive, for example, where school funding is decided at local levels. In short, social consumption spending only appears to increase economic mobility at the cross-national level when accompanied by social investment - as the striking differences between Southern Europe and Scandinavia suggest. However, social investment alone may not always produce higher mobility - the USA / Canada comparison demonstrates this quite sharply.

The specific mechanisms underpinning these macro-patterns are far from clear. In a recent piece, James Heckman and his collaborators (Landersø and Heckman, 2017) exploit rich panel data in Denmark to raise questions about what they provocatively refer to as the *Scandinavian fantasy*, namely the idea, reflected in our data, that large redistributive states are the breeding ground for mobility and inequality in the long run as oppossed to small

and hardly redistributive ones like the USA. Heckman et al.'s analysis highlights, among other things the need for precision, as they find that the result of the comparison and the inferences to be drawn depend on the specific income measure at work. They also highlight the importance of feedback channels: oddly enough, the impact of family background on educational attainment is similar in the US and in Denmark, yet for different reasons. In the US poor families cannot invest in future generations; in Denmark, they choose not to, in part because of wage compression and a generous welfare state. These are key political factors, as is in the case of the US whether low income families have sufficient access to publicly funded educational resources. Focusing on this specific mechanism, this paper delves deeper the micro-foundations behind these cross-national patterns.

To do so, we take two steps. Analytically, we shift the focus in recent debates on inequality from inherited wealth and unproductive capital to human capital, a key driver of the potential equalization of economic opportunities over time largely crowded out by the nature of Piketty's data (and a major reason behind the fact that the the USA seems to be an outlier in his analysis). We develop a model that examines how institutional level outcomes such as the tax rate and labor market calcification affect individual choices about private investment in the human capital of children, as well as examining how calcification (our most obviously 'exogenous' parameter) affects citizens' preferred tax rates. We show the existence of various equilibria in intergenerational income mobility, as determined by labor market calcification and the prevailing level of investment in public education, indicating what lays under the patterns we saw in Figure 1.

Our analysis contributes to a better understanding on the interplay between inequality of condition/resources and the distribution of economic opportunities across generations in the broader sense that (Atkinson, 2015) highlighted in his latest book. A key future step in the agenda of inequality is to illuminate why the distributions of income and wealth are overlapping more and more over time. Our model highlights a path through which assets

and income lead to better opportunities for earnins and further accumulation of assets over time. We focus on a particular mechanism, namely educational investments, but the logic, as (Atkinson, 2015) suggests, can be easily extended to understand wealth constraints early in the life course (lack of assets or debt) or the polarizing effects of policies other than educational interventions. In addition, by highlighting the way in which tax policy and public education spending choices shape family incentives to invest in the next generation's skills, our model introduces political economy into the pure economics of mobility (Becker and Tomes, 1979) on the one hand, and the micro-economic sociology of intergenerational life chances, largely devoid of consideration to political and institutional factors.

Empirically, we now move from aggregate, cross-sectional data, to household, longitudinal data within one country: the United States. As we saw above, the USA is in an interesting position cross-nationally, with relatively high social investment but low intergenerational mobility. The answer to this puzzle may lay in part in the substantial variation *within* the Unites States across states and localities in how they make public investment choices, particularly in education. This subnational variation presents an opportunity to examine the effects of policy choices on mobility outcomes while holding national level forces constant.

Moreover, the USA has a plethora of data sources providing fine-grained data on economic mobility. By relying on the United State's *National Longitudinal Survey of Youth* we have information on a representative sample of individuals since they enter the educational system (low teens) until the reach maturity as wage earners (early 40s); by matching the geo-locational information of these individuals to the political units under which they were exposed to different investment (educational) policies we are able to exploit the significant subnational variation in the United States to explore whether it is in fact the case that more ambitious, and comprehensive investment policies actually improve economic opportunities in the long run, thus establishing whether the political choice by the agencies in charge of these policies are actually the mechanism driving these differences.

Raj Chetty and his collaborators have effectively shown that where you live in the US matters for the sort of of economic opportunities you enjoy in live (Chetty et al., 2014). Our paper provides an exploration behind the geographical variations identified by Chetty et al. In pursuing this logic, our identification strategy relies on a series of court rulings at the state level on the issue of school financing equalization as a form of protecting civil rights (Reed, 1996). These rulings, triggered by judicial cases largely independent of local political or budgetary cycles, had in many cases major implications for both the level and equity in the distribution of resources across the states and thus provide a plausibly exogenous treatment that allows us to identify the impact of investment policy choices on mobility patterns. Finally, our approach us to contribute to an ongoing debate between economists and sociologist about the role of education in life chances beyond aggregate cohort analysis (Bukodi et al., 2015).

Finally, we turn to new survey evidence from England where we have local data on the proportion of people who attend higher education - a proxy for social mobility. We show that this proxy is closely related to views about whether people had a fair chance to get the education or job they sought. We then examine the connection of this measure of social mobility to expressed preferences over private and public education, finding mixed support for our model.

The rest of the paper is organized as follows: Section 2 presents our model of intergenerational transmission of income. Section 3 presents our data and identification strategy, and outline the approach to identifying the impact of state-level educational policy choices on long-term income. In Sections 4, 5, and 6 we present our findings and discuss the core empirical implications. Section 7 concludes.

2 A Simple Model of Intergenerational Mobility

To think about the determinants of intergenerational income mobility we develop a formal model that incorporates the role of public and private spending on education and the calcification (and hence heritability) of the labor market. Our model, like that by Roemer (2004) is one where parents can choose how much to invest in their offspring and we examine how that decision is affected by the prevailing provision of public education (provided through taxation) and by the degree of 'calcification' of the labour market - by which we mean the degree to which jobs are nepotistically rather than meritocratically allocated.

To foreshadow our findings we show that the capacity of parents to ensure -through private investment - that their children remain at the same point in the income distribution - that is their capacity to reduce intergenerational mobility - is lower where public spending on education is higher or where labor market calcification is more rigid. Hence both public spending and calcification are substitutes for private investment in children. However, whereas public education increases intergenerational mobility, labor market calcification reduces it. This leads to 'three worlds' of intergenerational mobility: it is high where public investment on education is also high (the paradigmatic case being Sweden) but low where either (a) public investment in education is replaced by private investment (as in the USA) or (b) labor market calcification means that neither form of education affects returns and hence jobs are 'handed down' (as in Greece).

Family Utility Function: Our model assumes an altruistic family, where parents make investment and consumption decisions with the attempt to jointly maximize their current utility and the utility of their children in the future. To simplify matters we assume only two periods (parents live for one period and have children who also only live for one period and parents care about their own consumption and that of their children). We assume a Cobb-Douglas form for family utility, where the parameter α reflects the degree to which

parents value their current consumption respective to their children's future consumption.

Parents are taxed in the present with a linear income tax t on their labor market income y_i and this is used to provide public education $H(t)$ for their children. There is no taxation in the second period. Parents can also choose to invest a proportion π_i of their income in their children's human capital, which may produce returns $G(\pi_i, t)$ in the future. However, the degree to which educational investments actually produce returns for children depends on the calcification of the labor market λ. In a highly calcified labor market ($\lambda = 1$), children earn exactly what their parents did. By contrast in a highly meritocratic labor market ($\lambda = 0$), children's earnings are entirely determined by the investments made in their human capital both through private investment $G(.)$ and public investment $H(.)$. Putting this together, our family utility function can be written as follows:

$$u_i = \Big[(1-t)(1-\pi_i)y_{it}\Big]^{\alpha}\Big[\lambda y_{it} + (1-\lambda)\Big(G(\pi_i, t) + H(t)\Big)\Big]^{(1-\alpha)}$$

Choosing the optimal level of private investment : We now turn to examine parents' choices over the share of their resources π_i to invest in their children's human capital. In order to analyze this expression we need to make some assumptions about the functional forms $G(.)$ and $H(.)$. For simplicity we model these as linear functions of moneys spent - hence $G(\pi_i, t) = g(\pi_i((1-t)y_i)$ and $H(.) = h(t\bar{y})$, where g and h are constant terms that reflect the relative income returns to investment in, respectively, privately provided and publicly provided human capital (hence if both forms of education are equally valuable $g = h$).

$$u_i(\pi_i) = \Big[(1-\pi_i)(1-t)y_{it}\Big]^{\alpha}\Big[\Big(\lambda y_{it} + (1-\lambda)\Big(g(\pi_i(1-t)y_{it}) + h(t\bar{y})\Big)\Big]^{(1-\alpha)}$$

The optimal expression for π_i^* is taken by solving the first order condition for $\partial u_i/\partial \pi_i$:

$$\pi_i^* = (1-\alpha) - \alpha \frac{\lambda y_i + (1-\lambda) ht\bar{y}}{(1-\lambda) g(1-t) y_i} \tag{1}$$

This expression is made up first of the relative value of children's future income $(1-\alpha)$ and then an expression reflecting the tradeoff between either children's income that is not determined by private investment (inherited jobs or returns to public education) and the returns to private education. We now examine the comparative statics of this expression. We begin with the effect of rising individual income on investment decisions:

$$\frac{\partial \pi_i^*}{\partial y_i} = \frac{\bar{y}(\frac{h}{g})(\frac{t}{1-t})}{y_i^2} > 0 \tag{2}$$

We see the effect of income is, unsurprisingly, positive. Richer people benefit proportionally less from public education since they can 'out-invest' the level of publicly provided education through private investments in their children. For poorer people that strategy is ineffective. The effect of income on investment choices is amplified by the relative returns of public to private education. Where public education is relatively productive, the income differences in investment will be even higher, essentially because for poorer citizens public education becomes even more attractive, thereby reducing any residual attractiveness of private investment strategies (formally, $\frac{\partial^2 \pi_i}{\partial y_i \partial h/g} > 0$).

Examining the relative productivity of public and private education and their effects on investment choices we produce very intuitive results:

$$\frac{\partial \pi_i^*}{\partial h} = -\frac{1}{g}\frac{t}{1-t}\frac{\bar{y}}{y_i} < 0 \tag{3}$$

$$\frac{\partial \pi_i^*}{\partial g} = \frac{\alpha(\frac{\lambda}{1-\lambda}) + ht(\frac{\bar{y}}{y_i})}{g^2(1-t)} > 0 \tag{4}$$

Here we see that the relative productivity of public education produces a negative effect on investment decisions and the relative productivity of private education has a positive effect on investment decisions.

We now turn to the tax rate's effect on individual investment decisions:

$$\frac{\partial \pi_i^*}{\partial t} = \frac{-h\bar{y} - (\frac{\alpha}{1-t})(\frac{\lambda}{1-\lambda}y_i + ht\bar{y})}{g(1-t)y_i} < 0 \tag{5}$$

The effect of taxation on preferred private investment is unequivocally negative - this suggests that in countries with high levels of taxation, all else equal intergenerational income transfer will be lower. The mechanism for this effect is twofold: first, taxation goes to public education which substitutes for private education; second, it reduces the amount of net income and hence makes current consumption relatively more attractive vis-à-vis investment.

The effect of calcification on private investment is:

$$\frac{\partial \pi_i^*}{\partial \lambda} = \frac{(1-\alpha)ht\bar{y} - \alpha y_i(\frac{1}{1-\lambda})}{(1-\lambda)g(1-t)y_i} \tag{6}$$

This expression will be negative for all citizens whose income meets the following inequality:

$$y_i > (1-\lambda)\frac{1-\alpha}{\alpha}ht\bar{y} \tag{7}$$

Who are these citizens? We begin by noting that if calcification is already high ($\lambda \to 1$), then this inequality will apply to all citizens with incomes arbitrarily above zero. Hence for all citizens, any reduction in calcification would produce *increased* private investment. If calcification is very low ($\lambda \to 0$), an increase in calcification will produce reduced investment provided individual income is higher than the expected average return to public education $ht\bar{y}$, adjusted by the relative weighting of the present versus the future (through α). Unless, public education is an exceptionally good investment ($h \gg 1$), this implies that citizens

whose income exceeds the average cost of public education will respond to rising calcification with reduced private investment. Thus, at high levels of calcification its effect on private investment is unequivocally negative for all citizens and at low levels its effect is negative for citizens with moderately high incomes, precisely those who would be more likely to make major investments in private education in the first place. Accordingly, we view calcification and private investment as *substitutes*.

We now turn to deriving the optimal tax rate for citizens, holding $\pi = \hat{\pi}$ so that we can examine the trade-off between taxation and other elements of the model:

$$t_i^* = 1 - \alpha\left(\frac{\bar{y} + \frac{\lambda}{1-\lambda}y_i}{h\bar{y} - g\hat{\pi}y_i}\right) \tag{8}$$

We begin with the effect of calcification on taxes:

$$\frac{\partial t_i^*}{\partial \lambda} = -\frac{\alpha y_i}{h\bar{y} - g\hat{\pi}y_i}\frac{1}{(1-\lambda)^2} \tag{9}$$

The sign of this expression equals the sign of $(g\hat{\pi}y_i - h\bar{y})$. This expression is more likely to be negative if individual income is low or if the returns to private versus public education are low. To simplify somewhat, if public and private education were equally effective $h = g$, then the sign of $\partial t_i^*/\partial\lambda$ would be negative for those individuals such that $\hat{\pi}y_i < \bar{y}$. Since $\hat{\pi} \in [0, 1]$ this implies that for sure all individuals with below mean income have $\partial t_i^*/\partial\lambda < 0$ and this threshold would be lower for any individual investing $\pi_i < 1$. Since most median voter models of tax choice presume that the decisive voter in any policy choice has below mean income, this implies that taxes funding public education will likely be lower in countries with calcified labor markets. Accordingly, we presume that $\partial t_{med}^*/\partial\lambda < 0$. This latter finding helps to explain the relatively low levels of public education spending in Southern European countries who have high levels of job heritability.

The other comparative statics of the optimal tax choice are fairly simple. The effect of

public education productivity is positive:

$$\frac{\partial t_i^*}{\partial h} = \alpha \frac{\bar{y}(\bar{y} + \frac{\lambda}{1-\lambda} y_i)}{(h\bar{y} - g\hat{\pi} y_i)^2} > 0 \tag{10}$$

By contrast the effect of private education productivity is negative:

$$\frac{\partial t_i^*}{\partial g} = -\alpha \frac{\hat{\pi} y_i(\bar{y} + \frac{\lambda}{1-\lambda} y_i)}{(h\bar{y} - g\hat{\pi} y_i)^2} < 0 \tag{11}$$

The effect of individual income is unsurprisingly negative:

$$\frac{\partial t_i^*}{\partial y_i} = \frac{g\hat{\pi} y_i((\alpha - 1)(\frac{\lambda}{1-\lambda})) - \bar{y}(\alpha h \frac{\lambda}{1-\lambda} + g\hat{\pi})}{(h\bar{y} - g\hat{\pi} y_i)^2} < 0 \tag{12}$$

Finally, the cross-derivative of calcification and individual income is also negative:

$$\frac{\partial t_i^{*2}}{\partial \lambda \partial y_i} = -\frac{1}{(1-\lambda)^2} \frac{\alpha h \bar{y}}{(h\bar{y} - g\hat{\pi} y_i)^2} < 0 \tag{13}$$

What is the implication of this negative cross-derivative? The implication is that labor market calcification *amplifies* the impact of individual income on preferences over the level of taxes used to supply public education.

To summarize, the model has shown that prevailing rates of taxation for public education and labor market calcification both reduce the incentive to invest in one's own children. Moreover, calcification is negatively associated with the preferred level of taxation of the median voter and hence the median voter's preferred level of public education provision. The implications for thinking about social mobility are as follows.

High levels of private investment in private education will lead richer citizens to have richer children (since the returns to private education are proportional to parental income) - this produces lower social mobility. However, private investment will be reduced under two circumstances, where public education spending is higher and where calcification is

higher. The former case produces higher levels of social mobility since children's incomes are proportional to mean (not parental) income. However the latter case is one where social mobility remains low - not because of private investment but because of the nepotistic nature of job transfer. Presuming $g > 1$ and $h > 1$, this last outcome also leads to lower rates of collective income growth since investment in both public and private education is low. We now turn to examining how institutional features affect intergenerational income transmission empirically.

3 Data: Description and Methodological Approach

From our model, the following testable propositions emerge that can be examined using single-country data:

1. Children's long term income is a function of both the level of public investment in education at the time children were schooled and parents' income (Direct Effects)

2. The higher the level of public investment in education, the lower the impact of parents' income on children's long term income (Interactive Effect)

The third hypothesis was that aggregate labor market calcification both reduces intergenerational social mobility and is associated with lower public spending. We leave discussing this until the next section using data from the UK. Accordingly, in this section we focus on the effects of public investment in education, where it is less challenging to find subnational variation and to connect this to intergenerational social mobility.

Our empirical strategy to evaluate the two claims related to public education investment consists of two steps. First, we present a mixed level approach using a dataset combining the NLSY (National Longitudinal Survey of Youth, 1979-2000) and a state-level data set computing each state's spending in K-12 during the period of education of survey respondents.

To link these two data sets, we geo-code the locational information of NLSY respondents and match them with the relevant policy input at the state level. Second, we instrument for state effort in education by using state court decisions on equalizing spending across school districts.

In both cases, the key dependent variable is a measure of permanent income of the children. We compute two measures: one for permanent wages (divided by 10,000), that is earnings in the labor market, and one for logged permanent total income, including returns from private wealth and public transfers. Both indicators of 'permanent income' measures were created by taking the mean income of the respondent from the age of 18 to the last year of the survey.

The main independent variables of interest are the level of state educational expenditures, which we geo-code and match to the state/year for the relevant NLSY respondent, logged parental income, and the state education variable interacted with parental income. The state education expenditure variable measures the amount that the state government spent per pupil while that particular respondent was in school, adjusted for inflation.[4]

In line with the model, we include the following individual level controls: gender, race (which we operationalize with two dummy variables capturing whether the respondent self-identifies as belonging to a Black or a Hispanic minority), and whether the respondent is self-employed or not. This helps control, in part, for his exit options vis-à-vis the remuneration of skills in the labor market. [5]

At this point we refrain from reporting a large number of state-level controls. The number

[4]Thus the state education expenditure variable varies across states and across all individuals of different ages within states, but not among all individuals of the same age within a particular state.

[5]In future iterations of the project we plan to introduce additional controls related to the theoretical model, especially whether the parents opted out for private education of their children. There is a danger though of overfitting this model - we do not wish to introduce post-treatment effects, where the treatment can be viewed as the interaction of state education spending and parental income. Since both of these variables are causally prior to, for example, the current occupation of the child, controlling for occupation (or other post-treatment variables) will bias our estimation of the treatment.

of possible variables mediating the correlation between parents and children income is quite large: racial composition of the state, aggregate levels of self employment or educational achievement etc. We have indeed used some of these macro-level covariates as a control, and the results seem robust. For now, we are simply reporting most of our models below with state fixed effects to capture the potential effect of any time invariant unobservable characteristic of the state economy potentially mediating our results. We have also added year fixed effects to capture common trends across states. Some major structural transformations in the economy (major structural features of the economy (such as the sectoral composition, the declining share of the agricultural employment, the increasing urbanization rate, or the immigration rate) are common across states (though intensity levels vary) and are captured in this somewhat crude way.[6]

4 Multilevel Modeling of Intergenerational Mobility

To estimate the effects of state-level education spending on intergenerational mobility we present two sets of mixed level linear regression models (Rabe-Hesketh and Skrondal, 2008): one for wages as a dependent variable and the other for logged permanent income. For each analysis we run three models: a baseline model with state-level random intercepts; a model with state-level fixed effects; and finally a model with state and year fixed effects.

We begin by discussing Table 1, which has children's wages as its dependent variable. Across all four models we see similar results. Parental income is unsurprisingly strongly positively correlated with the wages of their children. Perhaps surprisingly, there is no significant direct correlation between state education spending and children's income - albeit at the lowest level of parental income. This is rather misleading though, as parental income rises there is a negative relationship between state education spending and childrens' wages

[6]In future iterations of the manuscript we plan to discriminate more precisely the potential role of theoretically motivated confounders

Table 1: Intergenerational Inequality: Wages

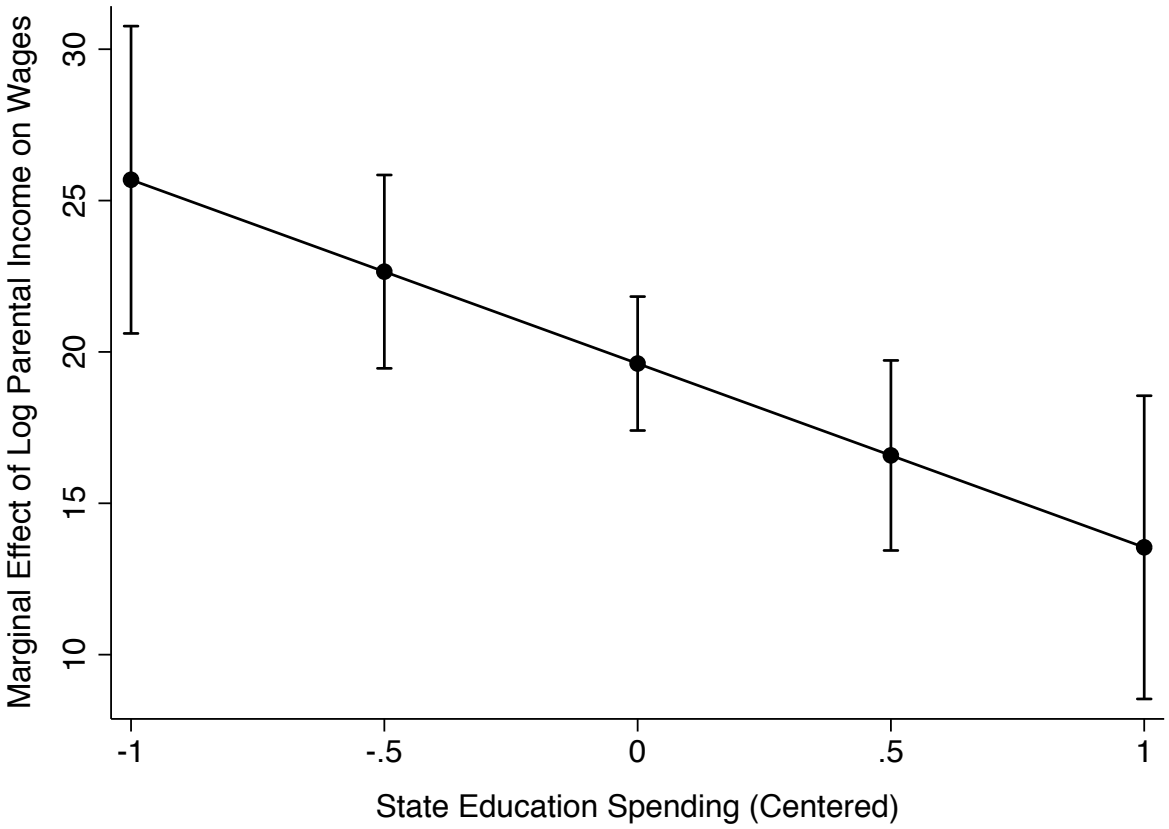
	(1)	(2)	(3)
Parental Income X State Educ.	-5.96	-6.07	-3.15
	(2.32)	(2.31)	(2.24)
State Educ. Spending	-0.78	0.33	2.31
	(2.80)	(5.20)	(5.04)
Parental Income	19.62	19.62	16.88
	(1.13)	(1.13)	(1.10)
Black	-7.70	-7.24	-7.21
	(2.22)	(2.28)	(2.21)
Hispanic	-4.59	-5.73	-4.28
	(2.61)	(2.69)	(2.61)
Female	-28.01	-27.81	-29.80
	(1.74)	(1.73)	(1.68)
Self Employed	48.92	53.56	19.36
	(14.94)	(15.16)	(14.94)
Constant	76.10	70.80	57.85
	(2.07)	(5.27)	(5.26)
N	5938	5938	5938
State Effects	R	F	F
Year Effects	.	.	F

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

- or perhaps more intuitively, as state education spending rises, the marginal effect of an increase in parental income on children's wages declines. This negative interaction holds across all the models, albeit at substantially reduced robustness in Model 3 where we include year dummies as well as state dummies.

Figure 2 demonstrates the sharp decline in the marginal effect of parental income on wages at various levels of state education spending (normalised so that zero is average spending), using Model 2. We see here that a rough doubling in parental income (i.e., an increase of a log point) is associated with an increase in children's wages everywhere but at sharply

Figure 2: The Relationship between Public Education Spending and the Marginal Effect of Parental Income on Wages



reduced effect where state education spending is high. Where state education spending is one percent point of state GDP higher than the average the effect of parental income doubling is to increase wages by around $15,000, whereas where education spending is one precent point of state GDP lower than the average the same change in parental income is associated with a $25,000 increase in children's wages. The 95 percent confidence intervals are fairly tight, demonstrating that this is a statistically significant difference.

Table 2 repeats the exercise with children's logged permanent income as the dependent variable (i.e. it is on the same scale as parental income). We see an extremely similar pattern as before. Figure 3 demonstrates the conditional effect of parental logged income on

children's logged income - here we see at low levels of state education spending the elasticity of intergenerational income is around 0.4 but this decreases to around 0.3 at high levels of state education spending.

In summary, these results suggest some important differences in intergenerational income transmission across the US states, dependent on the prevailing level of state education investment (both across-state and within-state). But of course, political decisions about public spending are likely dependent on citizens' preferences at that time and these preferences are likely shaped by both current and expected incomes. Our next section provides an empirical approach that aids with this identification problem.

Figure 3: The Relationship between Public Education Spending and the Marginal Effect of Parental Income on Permanent Income

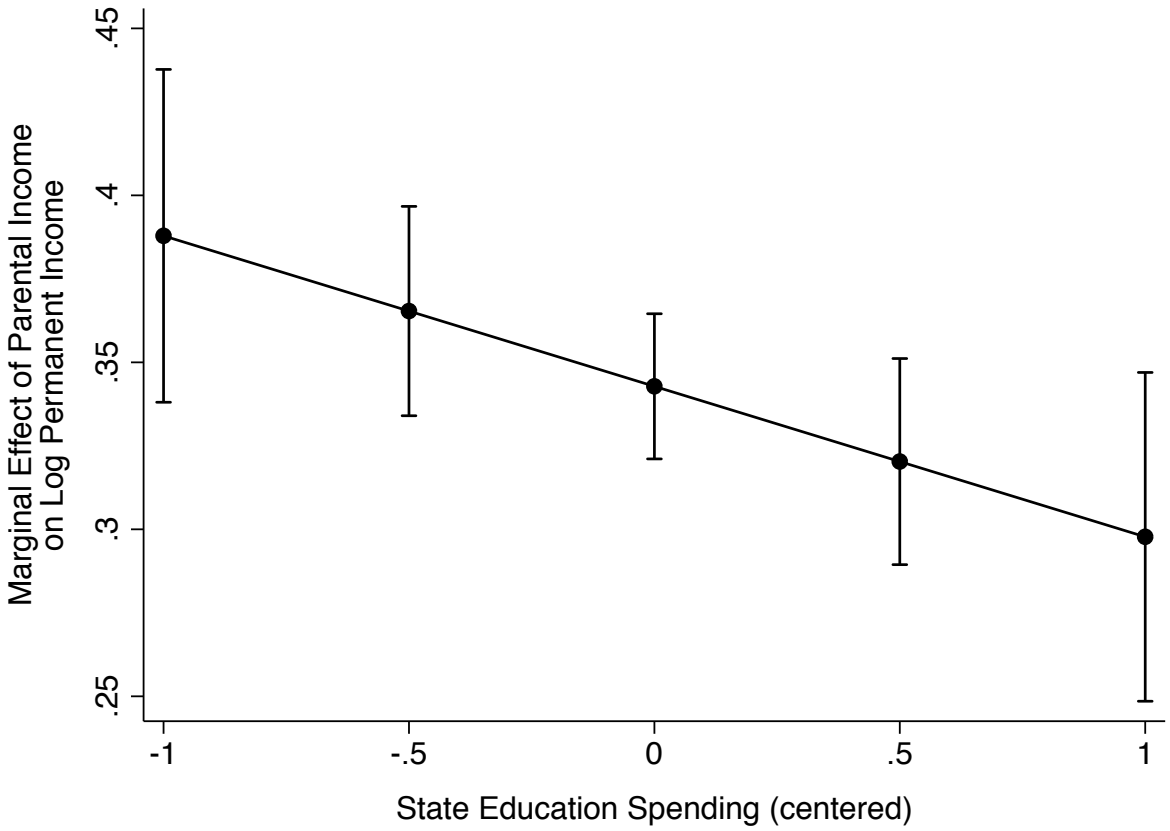


Table 2: Intergenerational Inequality: Incomes

	(1)	(2)	(3)
Parental Income X State Educ.	-0.05	-0.05	-0.02
	(0.02)	(0.02)	(0.02)
State Educ. Spending	-0.05	-0.07	-0.05
	(0.03)	(0.05)	(0.05)
Parental Income	0.34	0.34	0.32
	(0.01)	(0.01)	(0.01)
Black	-0.38	-0.38	-0.37
	(0.02)	(0.02)	(0.02)
Hispanic	-0.12	-0.12	-0.10
	(0.03)	(0.03)	(0.03)
Female	0.00	0.01	-0.01
	(0.02)	(0.02)	(0.02)
Self Employed	0.40	0.42	0.13
	(0.15)	(0.15)	(0.15)
Constanr	10.85	10.76	10.66
	(0.03)	(0.05)	(0.05)
N	5927	5927	5927
State Effects	R	F	F
Year Effects	.	.	F

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5 Court Cases as Exogenous Shocks

In the aftermath of the Civil Rights movement in the United States, a period of judicially supervised educational policy efforts ensued. While the US Supreme Court closed judicial intervention on school policy on the basis of direct racial desegregation a long time ago, judicial intervention trickled down to the issue of financing disparities across different school districts within states. According to Reed (1996), since 1973, courts in 27 states have ruled on school financing suits under provisions of state constitutions. These rulings have had enormous consequences on both the level and the distribution of public investments in education across US states. To give an example of a state where the consequences were moderate in scale (Texas), between 1988 and 1995, as a result of a pro-increase state court ruling, the coefficient of variation across counties in the level of per pupil total operating expenditures (minus federal aid) fell from 0.166 to 0.112 (a 33% reduction). Following its own court rulings, Kentucky saw its spread on the same indicator fall from 0.217 to .12, a 45% reduction in the level of resource inequality across the counties.

These are substantively significant changes. More importantly, to the extent that are the result of judicial decisions (allegedly a stream of power independent from the electoral cycle in timing and ideological orientation),[7] they work as exogenous shocks on the levels of public education investment. Moreover, these ruling are not always 'expansionist', in many cases they actually reversed the degree of school equalization - hence they provide both positive and negative shocks to schooling, depending on the nature of the particular ruling.

Accordingly, we have constructed a variable that takes the value of -1 if the state level court ruling orders a reduction in the level of educational effort for the purposes of equalization, 0 if there is no ruling in either direction, and 1 if the ruling implies a de facto expansion

[7] In a subsequent version will explore the correlation between the direction of the rulings across states, the timing of the rulings, and the state-level electoral cycle, validating the premise that these rulings are actually reasonably independent from political pressures.

of the budgetary effort in education. We then use this variable to instrument the level of public education expenditure in our models and ameliorate the potential reverse causality feeding back from the cumulative effects of prior investments on education in the political process. Tables 3 and 4 present the results obtained through this approximation.

Table 3: Intergenerational Inequality: Wages Instrumented

	(1)	(2)	(3)
Education (IV)	-2.89	-573.78	-97.45
	(3.18)	(59.27)	(108.59)
Parental Income	19.60	18.87	16.86
	(1.13)	(1.12)	(1.10)
P. Income X Ed.	-6.41	-6.27	-3.34
	(2.44)	(2.41)	(2.36)
Black	-7.71	-6.88	-7.20
	(2.22)	(2.26)	(2.21)
Hispanic	-4.43	-5.39	-4.29
	(2.61)	(2.67)	(2.61)
Female	-27.99	-28.05	-29.81
	(1.74)	(1.72)	(1.68)
Self Employed	49.00	55.38	19.58
	(14.94)	(15.04)	(14.94)
Constant	76.10	170.49	75.13
	(2.07)	(11.51)	(19.52)
N	5938	5938	5938
State Effects	R	F	F
Year Effects	.	.	F

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Intergenerational Inequality: Income Instrumented

	(1)	(2)	(3)
Education (IV)	-0.06	-5.37	-1.46
	(0.04)	(0.58)	(1.06)
Parental Income	0.34	0.34	0.32
	(0.01)	(0.01)	(0.01)
P. Income X Ed.	-0.05	-0.05	-0.02
	(0.02)	(0.02)	(0.02)
Black	-0.38	-0.37	-0.37
	(0.02)	(0.02)	(0.02)
Hispanic	-0.12	-0.12	-0.10
	(0.03)	(0.03)	(0.03)
Female	0.01	0.00	-0.01
	(0.02)	(0.02)	(0.02)
Self Employed	0.39	0.44	0.13
	(0.15)	(0.15)	(0.15)
Constant	10.85	11.68	10.90
	(0.03)	(0.11)	(0.19)
N	5927	5927	5927
State Effects	R	F	F
Year Effects	.	.	F

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 4: The Relationship between Schooling (Instrumented) and the Marginal Effect of Parental Income on Wages

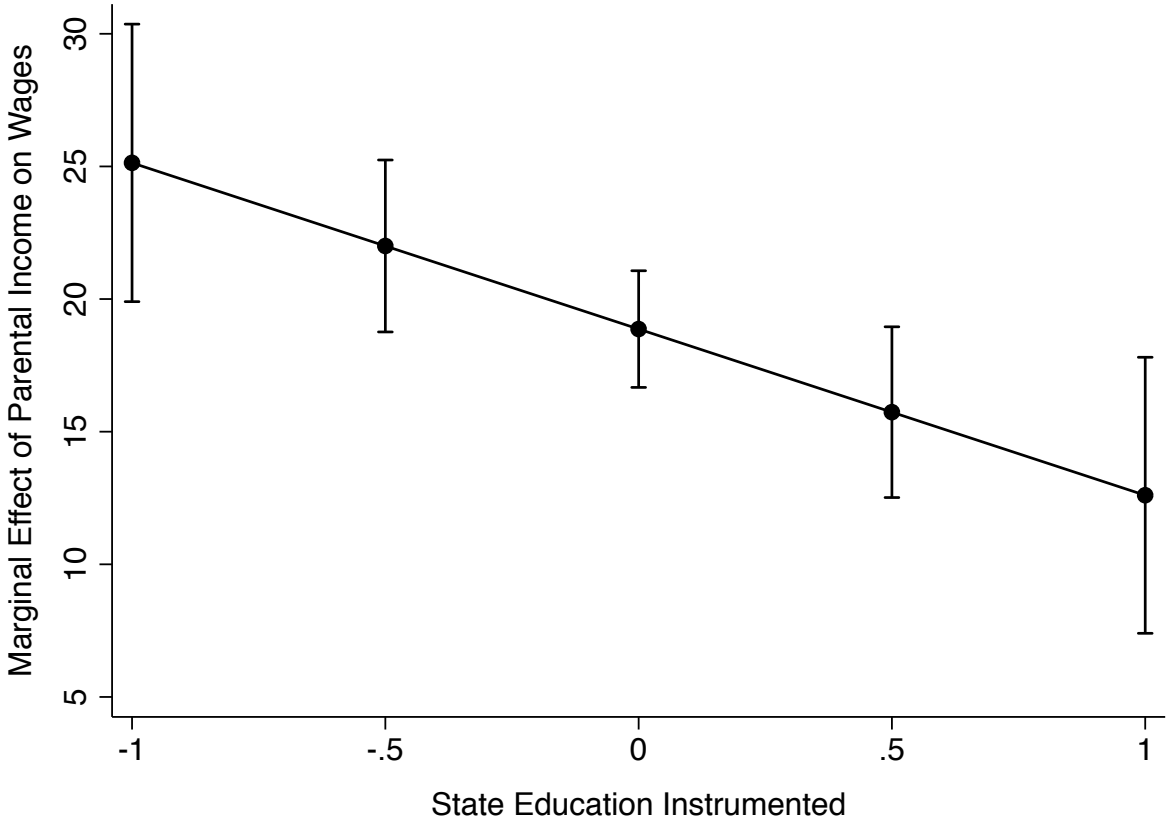
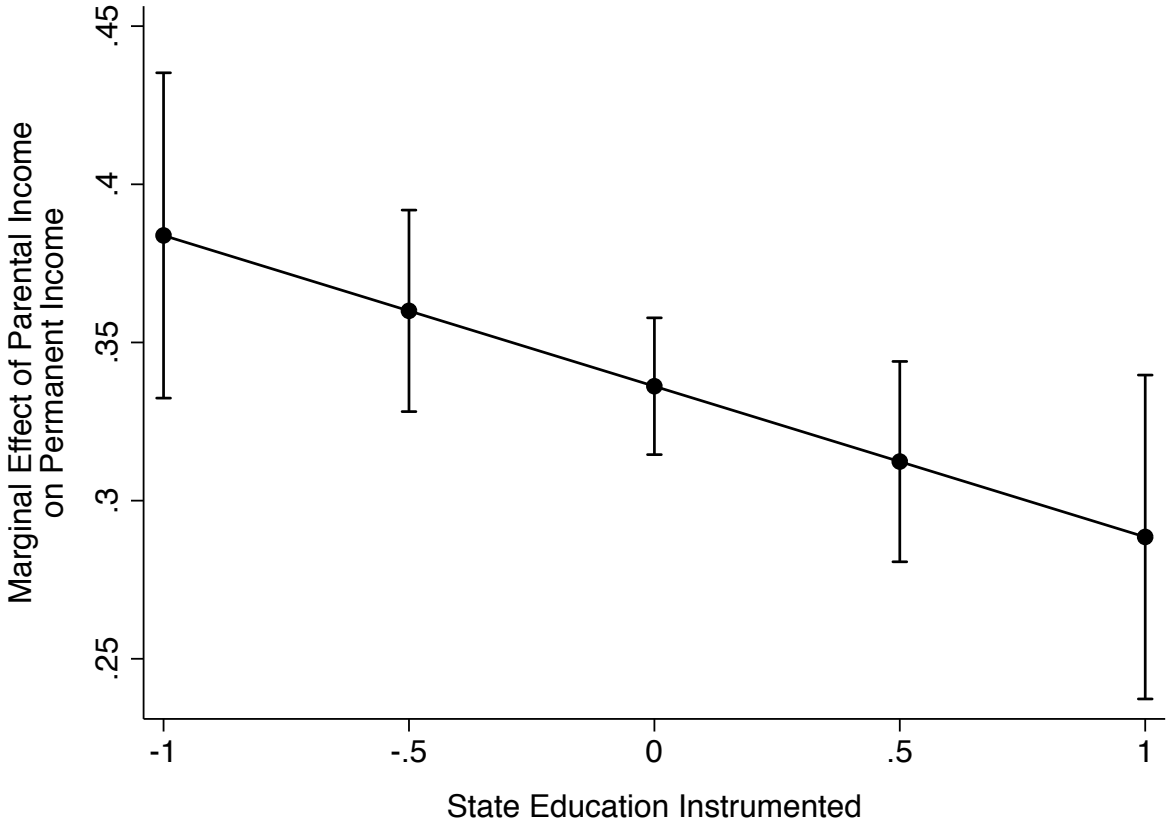


Figure 5: The Relationship between Schooling (Instrumented) and the Marginal Effect of Parental Income on Permanent Income



The findings reported in Tables 3 and 5 are very consistent with those in the multi-level models of intergenerational mobility, as are the marginal effects reported in Figures 4 and 5. As before, the independent effect of educational spending seems either null or negative in the case of very low levels of parental income. However, when the relationship is considered in full, we observe the same negative conditional relationship between parental income and educational spending. Higher levels of parental income drive up both wages and the permanent income of future generations, but they do so to a much lesser extent in areas with higher levels of educational spending. Reassuringly, the magnitude of the effects of interest in both cases is very similar in size.

The absence of a direct effect of educational spending in the case of low income families is intriguing. One possible mechanism behind these patterns is a sorting effect (Gingrich and Ansell, 2014; Tiebout, 1956): given an exogenous impact of the equalization effort through educational spending, upper and middle income families either opt out altogether or choose to sort into better counties and neighborhoods to limit their children's exposure to more heterogeneous pools of students. In the presence of these patterns one would expect the upward mobility impact of higher educational effort to be censored, benefiting primarily families in the mid to upper income brackets.

We conclude our empirical analysis by breaking the NLSY participants into groups by their attained education level. We do so in the awareness that this introduces a 'post-treatment' variable, since parental income and state effort on education likely both determine the degree of participation in education by the participants (that is, the definition of each subsample is likely endogenous to the treatment variables). With that caveat in mind, there remains the question about whether the estimated effects of state education effort on intergenerational income mobility are similar across education groups. There are a number of reasons to believe they might not be. In particular, our instrumental variable only reflects state efforts to equalize school funding, not higher education spending. Thus for those

Table 5: Effects of Education on Intergenerational Inequality by Schooling Level

	(1) No HS Wages	(2) HS Wages	(3) College Wages	(4) No HS Income	(5) HS Income	(6) College Income
Education (IV)	-317.44	-19.50	-363.93	-6.71	-0.94	-1.66
	(308.05)	(109.82)	(124.06)	(4.45)	(1.13)	(0.62)
Parental Income	8.73	13.43	19.11	0.21	0.28	0.17
	(1.72)	(1.27)	(5.27)	(0.02)	(0.01)	(0.03)
P Income X Ed.	2.31	-8.11	17.04	0.03	-0.07	0.04
	(4.40)	(2.65)	(12.25)	(0.06)	(0.03)	(0.06)
Black	0.16	-6.24	-13.14	-0.50	-0.37	-0.24
	(3.73)	(2.41)	(9.85)	(0.05)	(0.02)	(0.05)
Hispanic	11.38	-0.17	-26.03	-0.05	-0.05	-0.10
	(4.23)	(2.83)	(13.06)	(0.06)	(0.03)	(0.07)
Female	-20.11	-27.36	-62.89	-0.10	-0.03	-0.02
	(2.95)	(1.82)	(7.07)	(0.04)	(0.02)	(0.04)
Self Employed	-6.71	50.17	1249.82	-0.05	0.35	8.64
	(21.17)	(15.94)	(975.03)	(0.31)	(0.16)	(4.89)
Constant	123.62	67.59	192.99	11.79	10.91	11.61
	(54.62)	(20.00)	(32.08)	(0.79)	(0.21)	(0.16)
N	1055	4136	747	1054	4126	747

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

individuals who completed college one might anticipate that school equalization efforts would matter substantially less than for those who completed high school only. We also examine the group of individuals who did not complete high school. Expectations are weaker here - for those who dropped out early, the effects of high school equalization policies would presumably be weaker (since they missed a share of their schooling), however we also do not have the college effect to reckon with.

Table 5 replicates Model 2 from Tables 3 and 4 but breaks each specification down into three groups - respondents who failed to complete high school, respondents who completed high school, and respondents who completed college. The middle group is the largest of the three by some distance in terms of observations but for most of the individual level variables the coefficients in this subsample are in an intermediate position compared to those for non-high school and college - for example, being female or being black is associated with a negative effect on earnings for high school graduates but this effect is between those found for the other two groups. However, for our variable of interest - the effects of state equalization policies / education funding on intergenerational mobility - this intermediate pattern does not hold. Instead, *only* in the case of high school graduates do we find the expected negative pattern - that is higher state education spending is associated with a reduced effect of parental income on children's income. In both cases, the coefficient is about a third larger than in Tables 3 and 4, suggesting the results in those analyses of indeed driven by high-school graduates - the group for whom school equalization decisions ought to have had the largest effect on intergenerational mobility.

6 Calcification and Education Preferences: Data from England

In the formal model we argued that the level of labor market calcification should affect both the individual incentive to invest in private education and in terms of puyblic education preferences. Calcification is not simple to operationalize at the aggregate level both conceptually (why could individuals not move to another part of the nation with freer labor markets?) and operationally (it is challenging for example to find subnational data on percentage of family-owned firms or other indicators of nepotism).

With these caveats in mind we use data taken from a YouGov survey conducted in England on 3522 participants between the 29th of July and 8th of August 2022. In this survey participants are geocoded at the local authority level (we have 304 local authorities in the sample with an average of 11.6 participants in each). We use the TUNDRA data from the UK's Office for Students, which measures the proportion of 18 to 19 year olds in higher education using the area they were in school at sixteen to identify them geographically. In TUNDRA this is measured at the medium super output area (MSOA) level but we aggregate this up to the local authority level (weighting by relevant population) to match our survey respondents. Put simply, this provides a measure of the local rate of higher education entry. We subtract this measure from one to obtain our index of local calcification - the proportion of students not entering higher education.

Figure 6 show the distribution of this index across England, with a map specific to the local authority of Wakefield (in some iterations of the survey, respondents saw this localized map). Entry to higher education is broadly lowest in rural areas, including East Anglia, Cumbria, and the South West).

How good is this as a measure of calcification? The survey asked respondents whether they felt, compared to other people in England"I would have/ have had a fair chance of

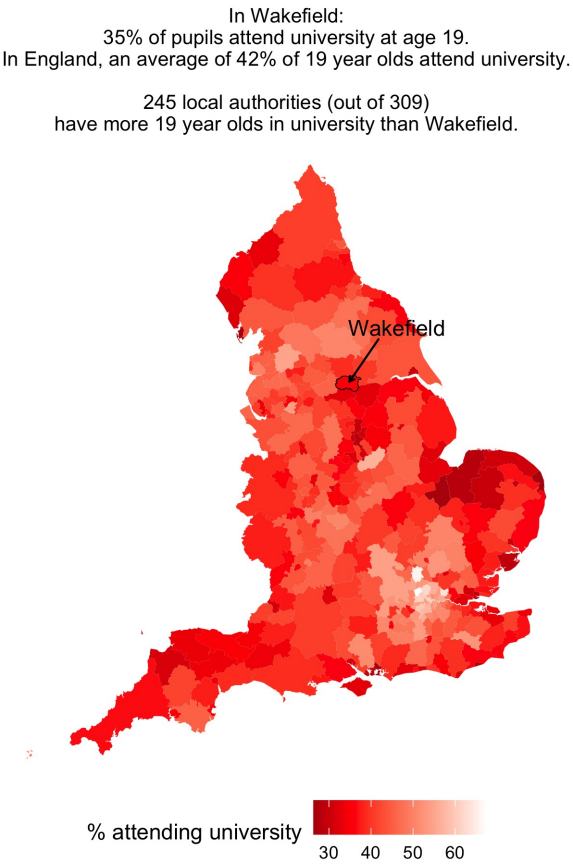


Figure 6: Example Choropleth from England Survey with Calcification Index

achieving the level of education I was seeking". They were also asked the same question but about their job: "I would have/ have had a fair chance of getting the job I was seeking". These are both five point scales from strongly disagree to strongly agree. Table 6 examines the correlation between local HE attendance and these two perceptions. In terms of controls we include local wage rates (to control for local economic wealth), and the respondent's household income, gender, age, education, and voting patterns in the EU referendum (shown) and the 2019 General Election (not shown). We also include dummies for each of the nine regions in England. In both cases we see a strong negative relationship between local calcification and agreement that the respondent's chance of getting their preferred education or job was fair. Figure 7 shows predicted levels of agreement with the statement (on a one to five scale). While higher education attendance rates are clearly an imperfect measure of calcification, the strong negative correlations between percent not going to higher education and these personal fairness measures is encouraging.

In order to test our comparative statics related to calcification from Section 2, we use two dependent variables - attitudes towards private and public education. It is worth noting that neither entirely matches the parameters in the model - which is about private investment choices and tax rate preferences (albeit the latter to be spent only on public education). The question we use for private education preferences is "Is it just or unjust that people with higher incomes can buy better education for their children than people with lower incomes?" - a five point scale ranging from very unjust to very just. The question we use for public education preferences is "Listed below are various areas of government spending. Please show whether you would like to see more or less government spending in each area. Remember that if you say "much more", it might require a tax increase to pay for it: Education", with a five point scale from much less to much more.

We run a set of analyses with these dependent variables and the same independent variables as above. The model predicted that higher levels of calcification would be associated

Table 6: Perceptions of Fairness

	Fair Chance (Education)	Fair Chance (Job)
% Not in HE (LA)	-1.386***	-1.118**
	(0.420)	(0.423)
Mean Pay (LA)	-0.051	0.141
	(0.320)	(0.322)
Household Income	0.035***	0.045***
	(0.006)	(0.006)
Age	0.002+	0.007***
	(0.001)	(0.001)
Education	0.188***	0.097***
	(0.020)	(0.020)
Voted Leave	-0.181***	-0.198***
	(0.054)	(0.054)
Didn't Vote (Brexit)	-0.041	-0.156*
	(0.069)	(0.069)
Num.Obs.	2535	2535
R2	0.109	0.099
R2 Adj.	0.100	0.091
AIC	7147.1	7178.6
BIC	7298.9	7330.4
Log.Lik.	-3547.532	-3563.310
F	12.763	11.528

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

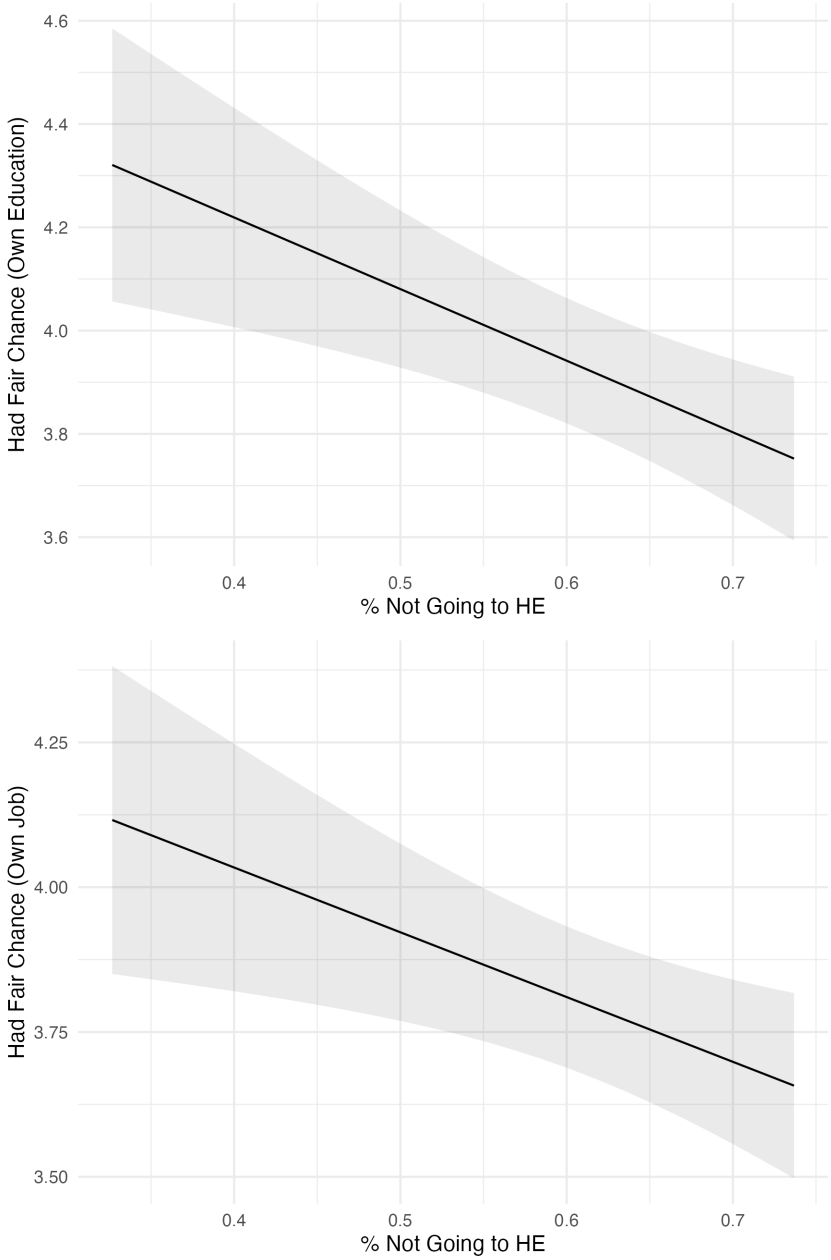


Figure 7: Predicted Fairness Responses

with lower levels of investment in private education. In the first model of 7 we find that local labor market calcification is negatively associated with the belief that private education is fair- consistent with this expectation. We also find that higher income individuals are more supportive of private education whereas older and less educated people are less supportive.

Models 2 and 3 have government spending public education as the dependent variable. Model 2 examines the direct effect of calcification and here we see the opposite of our expectation. The model finds calcification - under the expectation that $(g\hat{\pi}y_i - h\bar{y}) < 0$ - has a negative effect on public education preferences but our data finds the opposite. This could be becasue the parameters take on values such that in fact $(g\hat{\pi}y_i - h\bar{y}) > 0$, counter our discussion in the model section. Or we could be mismeasuring calcification. We do have some support however for the cross-derivative of income and calcification. In the model, this is negative - and we do indeed find that to be the case here. Figure 8 shows that it is only among lower income individuals that the impact of calcification on public education spending preferences is positive.

7 Conclusion

In this paper we have developed a first approximation to the intergenerational transmission of income and the role politics plays in it. Our model has shown that there are three ways to pass your income to the future generation: to freeze (or calcify) access to such income (or wealth),[8] to invest privately in future labor market opportunities opting out of the public education system, or via tax-financed public investment in education (or other social investments). The comparative statics show that these three mechanisms are substitutes for one another. They also show that the higher the levels of tax financed investments in public education, the lower the expected impact of parental income on that of subsequent

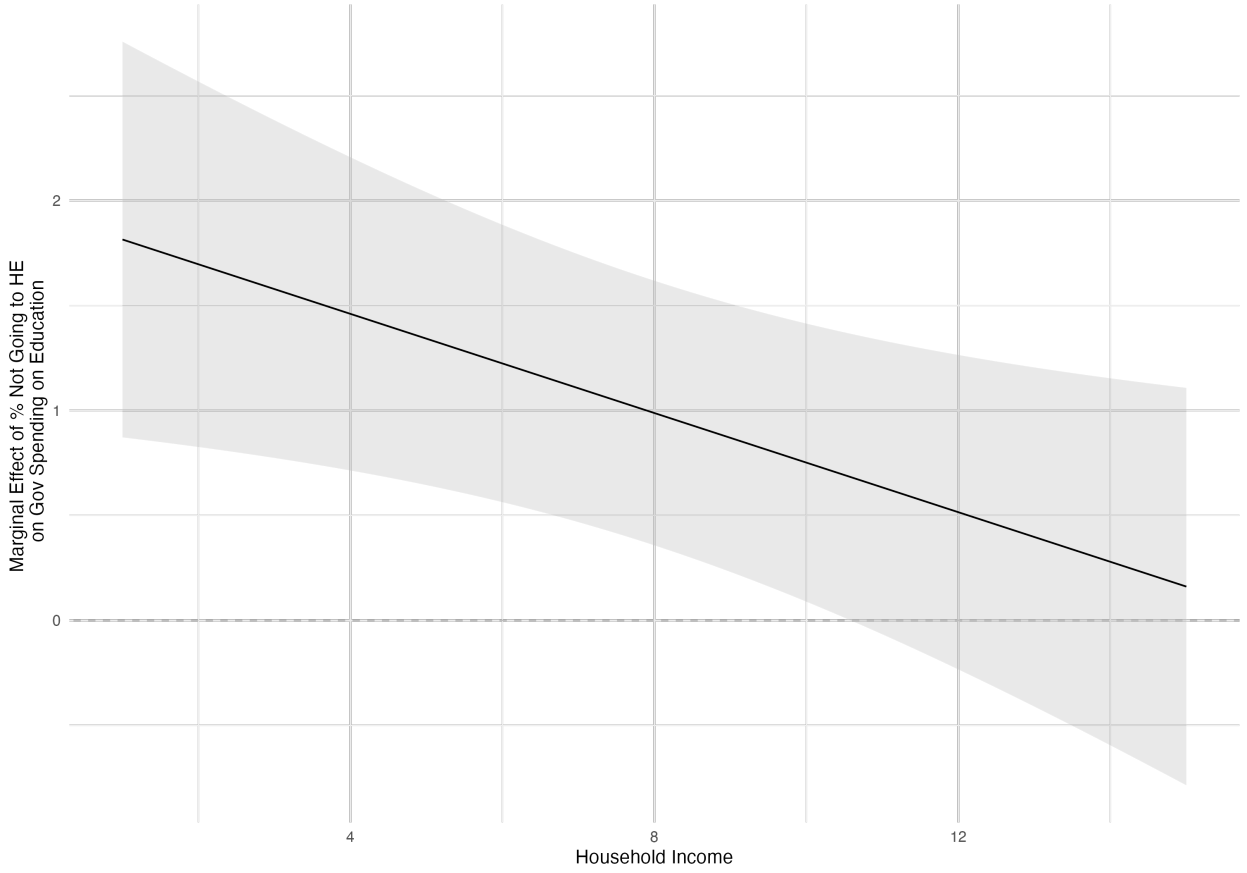
[8]The formal model can easily be extended to include wealth and a bequest motivation, albeit at the cost of substantially increased complexity for very similar qualitative results

Table 7: Attitudes towards Private and Public Education

	Private Ed Fair	Gov Spend Ed	Gov Spend Ed
% Not in HE (LA)	-1.419**	0.991**	1.933***
	(0.526)	(0.322)	(0.520)
Mean Pay (LA)	-0.371	0.557*	0.560*
	(0.414)	(0.245)	(0.245)
Household Income	0.017*	0.016***	0.084**
	(0.008)	(0.005)	(0.030)
Age	-0.006***	0.005***	0.005***
	(0.002)	(0.001)	(0.001)
Education	-0.088***	0.075***	0.074***
	(0.025)	(0.015)	(0.015)
Voted Leave	0.079	-0.219***	-0.220***
	(0.065)	(0.041)	(0.041)
Didn't Vote (Brexit)	0.183*	-0.066	-0.066
	(0.092)	(0.053)	(0.053)
Not in HE X HH Income			-0.118*
			(0.051)
Num.Obs.	1935	2535	2535
R2	0.140	0.145	0.147
R2 Adj.	0.129	0.137	0.138
AIC	5786.9	5796.9	5793.5
BIC	5937.3	5948.7	5951.2
Log.Lik.	-2866.459	-2872.448	-2869.772
F	12.449	17.709	17.242

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 8: The Marginal Effect of Calcification on Spending Preferences at Different Levels of Household Income



generations.

Our empirical findings lend support to this expectation and help substantiate an important political mechanism through which political actors shape observable patterns in income mobility in the United States between the mid 1970s and the mid 2000s. To come back to Chetty et al's question on where is the land of opportunity, our results suggests that the land of opportunity lies primarily where incumbents are able to undertake a sustained effort in the provision of public education. Economic opportunity emerges therefore as a genuinely political phenomenon.

Looking ahead, several avenues of inquiry open up both to consolidate the findings reported in this paper and to extend the scope of the agenda laid out by our formal analysis. On the former front, we are currently working on the analysis of the role of potential confounders, both at the individual and the state level analysis. In particular, and consistent with the model, we want to add controls for parents' choices to opt out for private education at the individual level, and several measures of aggregate labor market structure at the state level (though the latter are statistically covered in in part via state level fixed effects).

In terms of fully covering the comparative statics emerging from the model, the next hurdle is the analysis of the conditional relationship between labor market calcification (our λ parameter in the model) and the effect of parental income. Measuring the degree of labor market calcification is challenging because it is in part endogenous to the dependent variable (calcification and fluidity of opportunity are opposites, with the latter being strongly correlated with a weaker association between parents and children income), and because it is a complex multidimensional phenomenon. The idea is to tap the existing range of economic opportunities at the time investment decisions are made. One possibility we are currently evaluating involves using census data to compute an aggregate index of the returns to education by area (excluding of course parental income from the model) and then use this index as a mediating variable to assess the size of the income elasticity across generations.

In addition, two other avenues are worth pursuing: the first one involves endogenizing the probability of geographical mobility with respect to earlier investments by parents in either private or public education. One of the implications of our analysis is that the ability of citizens to move to greener lands of opportunity may well be a function of parents' prior investment decisions, thus providing a mechanism linking geographical mobility and the intergenerational transmission of wealth. The second one involves exploring the effects of institutional variation in terms of fiscal financing and the centralization of public education investments on the size and persistence of the income elasticity across space and time. This involves replicating the sort of analysis we have developed in this project in a range of other societies varying along these institutional dimensions. We regard these as important steps towards a better understanding of the political underpinnings of income mobility.

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