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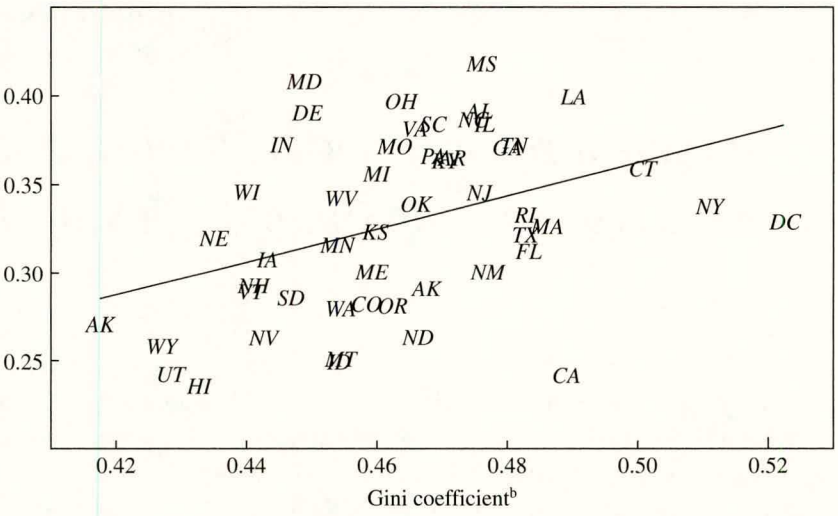
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Income Inequality, Social Mobility, and the Decision to Drop Out of High School

ABSTRACT It is widely documented that places with higher levels of income inequality have lower rates of social mobility. But it is an open question whether and how higher levels of inequality actually lead to lower rates of mobility. We propose that one channel through which higher rates of income inequality might lead to lower rates of upward mobility is lower rates of human capital investment among low-income individuals. Specifically, we posit that greater levels of income inequality could lead low-income youth to perceive a lower rate of return on investment in their own human capital. Such an effect would offset any potential "aspirational" effect coming from higher educational wage premiums. The data are consistent with this prediction: Individuals from low socioeconomic backgrounds are more likely to drop out of school if they live in a place with a greater gap between the bottom and middle of the income distribution. This finding is robust in relation to a number of specification checks and tests for confounding factors. This analysis offers an explanation for how income inequality might lead to a perpetuation of economic disadvantage, and it has implications for the types of interventions and programs that would effectively promote upward mobility among youth of low socioeconomic status.

International comparisons show that the United States is a country that ranks high in its level of income inequality and low in its level of social mobility. Miles Corak (2006)—building on the theoretical contributions made by Gary Solon (2004)—was the first to show empirically that this relationship is part of a broader pattern that exists across countries. Countries with high levels of inequality also tend to exhibit lower rates of social mobility, as measured by greater intergenerational income persistence.

Figure 1. The Great Gatsby Curve in the United States



Sources: Chetty and others (2014a); American Community Survey, 2014.
a. Higher values indicate less relative mobility.
b. Higher values indicate greater inequality.

Alan Krueger (2012) popularized this relationship as the "Great Gatsby Curve." Using data on the 50 states, we construct a Great Gatsby Curve for the United States. Figure 1 shows that states with greater levels of income inequality tend to have lower rates of social mobility.[1] This positive cross-sectional relationship between rates of income inequality and intergenerational income persistence often leads to claims about causality, implying that higher rates of income inequality lead to lower rates

1. Social mobility is a concept that includes the likelihood of moving up or down in the income distribution, which is specifically labeled as economic mobility, but may also include changes in position in other distributions as well, like educational attainment, occupational status, and health. We restrict our attention to economic mobility in this paper, but adopt the common approach of using the terms "social mobility" and "economic mobility" interchangeably. The specific mobility measure used here is taken from Chetty and others (2014a), and reflects the correlation in the income rank of parents and their adult child. It is worth noting that if we replaced the Gini coefficient with alternative measures of income inequality, we see the same relationship. In particular, the figure looks the same using the 50/10 ratio of income, which is our primary measure of income inequality in this paper, as described below.

of mobility.[2] However, it is very much an open question as to whether income inequality actually causes lower rates of social mobility, and if so, through what channels.

In this paper we propose, and investigate, one important channel—curtailed investment in human capital—through which higher rates of income inequality might lead to lower rates of upward economic mobility for individuals from backgrounds of low socioeconomic status (SES). We hypothesize that income inequality can negatively affect the perceived returns on investment in education from the perspective of an economically disadvantaged adolescent, either through an effect on actual returns or through an additional effect on the perception of these returns. The notion we have in mind is that a greater gap between the bottom and the middle of the income distribution might lead to a heightened sense of economic marginalization, such that an adolescent at the bottom of the income distribution does not see much value in investing in his or her human capital. We call this "economic despair." This could be due to adverse neighborhood or school conditions driven by elevated rates of income inequality, but it need not be. This mechanism offers an explanation within the standard human capital framework of decisionmaking for why greater inequality—which might reflect in part a greater return on human capital investment—does not necessarily lead to greater rates of educational attainment for certain segments of the population.

To empirically explore this idea, we investigate whether places characterized by higher rates of income inequality have situations that lead to lower rates of high school graduation among individuals from low-SES families, controlling for individual and family demographics and broader contextual factors. Greater educational attainment is a key pathway along which an individual from a low-income background can move up in the income distribution and obtain a middle-class life, or potentially even higher. If children from low-income backgrounds are responding to large gaps between their economic reality and middle-class life by dropping out of school, that would perpetuate economic disadvantage and impede rates of upward mobility. It would be a mechanism whereby income inequality

2. For example, in a conversation at *The Atlantic*'s 2014 Economy Summit, Jason Furman (2014) stated, "I think we think all else being equal, more inequality will lead to less relative mobility." Sawhill (2014) asserts that when the rungs of the ladder are farther apart, it gets harder to climb them.

leads to less mobility, and might explain why certain places regularly seem to have high inequality and low mobility, or vice versa. Furthermore, it would have profound implications for society and the types of interventions needed to break the cycle.

Our discussion in section I of relevant background facts and ideas addresses a number of important issues. We describe key reasons why the Great Gatsby Curve might not reflect a causal negative relationship between income inequality and rates of social mobility. First, there is the well-known empirical complication that the level of income inequality in a place is correlated with many other factors that also might have an impact on rates of social mobility. Empirically identifying which factor is driving what is extremely difficult. Furthermore, some have argued that the relationship might be merely descriptive, and not actually consequential.

We also describe an empirical puzzle that others have pointed out, namely, that income inequality has been rising for many decades with no observable decrease in social mobility rates. We describe two features of our model and empirical results that might help resolve this puzzle. First, we argue that adolescents' perceptions and expectations about the society around them and their place in it are likely shaped by the more permanent features of the environment in which they grow up, including long-term measures of inequality. Transitory or very recent changes in inequality are less likely to have a profound effect on adolescents' perceptions and experiences. It might be the case that the effects of rising income inequality are not yet manifested in observed rates of social mobility. Second, we propose that lower-tail income inequality (as captured by the ratio of household income at the 50th and 10th percentiles of the distribution—the "50/10 ratio") is more relevant to thinking about upward mobility than is inequality at the top of the distribution. Lower-tail income inequality has been fairly flat during recent decades.

In section II, we present a stylized model of the decision to drop out of high school. This simple model generates the possible existence of both the "aspirational" and "despair" effects of greater levels of income inequality within an otherwise-standard human capital investment framework. In this section we also review related conceptual models.

In sections III and IV, we then turn to a detailed description of our empirical analysis and results. We use individual-level data pooled from five national surveys to investigate how income inequality affects the rate at which low-SES youth drop out of high school, controlling for individual background characteristics and aggregate-level contextual factors. The data provide robust evidence that higher levels of lower-tail income

inequality lead boys from low-SES households to drop out of high school with greater frequency, controlling for a rich set of individual- and state-level characteristics. These data separately identify a negative effect of a higher high school wage premium on high school dropout rates and a positive effect of lower-tail income inequality on high school dropout rates. These two offsetting effects are consistent with our modified human capital investment model, in which inequality has competing aspirational and despair effects.

We also report the results from a number of alternative specifications. First, we investigate whether the observed relationship between income inequality and dropout rates is being driven by a number of potential confounding factors, such as other features of the income distribution (including upper-tail income inequality), aggregate poverty rates, and incarceration rates. Second, we devote considerable attention to the potential mechanisms that drive the observed empirical relationship between lower-tail income inequality and the decision of low-SES youth to drop out of school. The data do not offer support for a number of potential explanations for the link—including, most notably, residential segregation or eroded public school funding. Although we are ultimately unable to empirically establish a precise mechanism, the empirical relationship that we document is consequential, implying that greater levels of income inequality can perpetuate lower rates of social mobility, in part by leading low-income youth to engage in more dropout behavior. We conclude with a discussion of policy implications.

I. Background

The cross-sectional correlation between income inequality and intergenerational income persistence (which indicates a lack of social mobility) is not necessarily a causal relationship. In this section, we first elaborate on these points. Second, we discuss what measures of income inequality are likely most relevant to rates of upward mobility for low-income adolescents. Third, we explain how these observations might be relevant to the finding that social mobility rates do not appear to have fallen during recent decades. Fourth, we describe the cross-sectional relationship between income inequality and high school dropout rates. These discussions set the stage for us to then move on to a discussion of our proposed model characterizing the educational investment decisions of adolescents.

I.A. Interpreting the Cross-Sectional Correlation between Inequality and Mobility

One of the fundamental tenets of empirical economics is that correlation is not causation. As basic as this point is, it is one of which we often have to remind ourselves. For instance, in pathbreaking work on the measurement of mobility in the United States, Raj Chetty and others (2014a) report that the strongest correlates of high mobility areas are (i) less residential segregation, (ii) less income inequality, (iii) better primary schools, (iv) greater social capital, and (v) greater family stability. As an empirical statement of correlation, these are interesting findings. However, as the authors themselves emphasize, they are not indicative of causal relationships. They provide some insight into areas where further exploration should start—although not end—into understanding how the characteristics of a place might determine individual-level outcomes.

Unfortunately, in measuring outcomes that reflect economic disadvantage, many things are correlated, making it nearly impossible to determine what is actually driving these relationships. These correlations raise many questions and suggest a number of possible explanations. In May 2015, the Brookings Institution, as part of its Social Mobility Memos blog series, featured a series of seven blogs about the Great Gatsby Curve in which various authors offered other correlational observations as potential explanations for what is really causing low rates of upward mobility, including single-parent households, the failure to adequately invest in early childhood education, the breakdown of civic institutions, cultural norms, and the like.[3] The bottom line is that the evidence available to date has provided documentation of a negative correlation between inequality and mobility along with a host of other things, all of which are interesting, but none of which pushes the bar in terms of what can be presumed to be causal. To inform public policy, however, we really need to know about causal pathways.

Furthermore, the negative correlation between inequality and mobility may simply reflect something about the composition of the population, as noted by Corak (2013). It may not be that one causes the other, but rather that both high inequality and low mobility reflect underlying population characteristics. Gregory Mankiw (2013a) observes that low social mobility could occur even if there were equality of opportunity because of the

3. The blog posts can be found at www.brookings.edu/blog/social-mobility-memos.

inheritability of talent, intellect, and interpersonal skills.[4] If the entire population had equal inherited skills, inequality would be low and mobility would be great because realizing higher or lower economic outcomes would be largely the result of chance. If, however, a population comprises individuals with a large degree of variation in talents and abilities, then we might expect both high inequality in income and high persistence in income between parents and children, even in a full meritocracy.[5] This interpretation of the relationship has drastically different policy implications than if it reflects causation.

I.B. The Relevant Measure of Income Inequality for Upward Mobility Consequences

This paper is motivated to a large degree by the question of seemingly fixed differences across places. Why do some places consistently have high inequality with low mobility, and other places consistently have low inequality with high mobility? Taking an international perspective, year after year, the United States and the United Kingdom—generally considered low-mobility countries—have among the highest rates of income inequality for high-income countries, while Finland and Norway—generally considered high-mobility countries—tend to have low rates of income inequality. In the United States, we do not have annual measures of mobility, but certain places consistently have high rates of income inequality—for example, New York and Washington—while other places do not.[6]

This way of describing the situation makes it clear that we should be focused on long-standing differences in inequality, not year-to-year changes. In our conceptual framework and our empirical analysis, we focus on the permanent or semipermanent economic and cultural landscape in the place where an adolescent lives, as opposed to short-term fluctuations. If a state experiences a temporary decrease in income inequality, it is unlikely, for example, that neighborhoods will change

4. Becker and Posner (2012, 2013) make the same point.

5. Mankiw (2013b) makes this point clearly by offering as an example the skill of chess players. If we have one group of chess players who are all of roughly comparable ability, then who wins and loses the matches will be closer to a random draw, and mobility through the rankings will be high. If another group of chess players has some with greater ability and others who are weaker, then inequality in wins and losses will be higher, and mobility will be lower.

6. For instance, using data from the Integrated Public Use Microdata Series, we found that the correlation in the 50/10 ratio between the 1980 and 2000 census years averaged .74 across states (Kearney and Levine 2014).

sufficiently quickly and visibly that either economic opportunities or perceptions thereof will be altered. We thus explicitly refer to income inequality as a "fixed" characteristic of a place, and our empirical analysis reflects this.

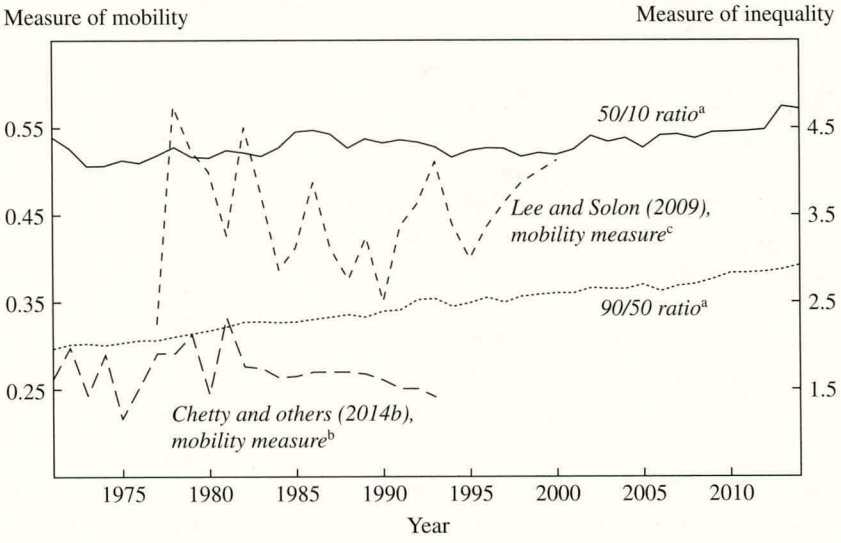
Furthermore, as an empirical fact, there is much more cross-sectional variation in lower-tail income inequality across states, as compared with the situation within a state over time. In the income data we describe below—which represent the 1980, 1990, and 2000 censuses—we find that the average standard deviation in the 50/10 ratio across states (averaged over time) is 0.43. Using the same data, we find that the average standard deviation in the 50/10 ratio over time within a state (averaged across states) is much lower, at 0.16.

Beyond the issue of permanent-versus-transitory characteristics, there is an important question about what is the most relevant inequality metric for economic mobility. We argue that the gap between the bottom and the middle of the income distribution is more relevant for the decisions of low-SES youth than the gap between the bottom and the top of the income distribution. We are explicitly interested in the upward economic mobility of low-SES children; and for children born into poverty or low-income families, we expect that their point of reference is more likely to be the middle of the distribution rather than the top. If the Great Gatsby Curve captures behavioral effects associated with growing inequality and the likelihood of moving up the economic ladder for those near the bottom, we propose that the 50/10 ratio is the more relevant measure of income inequality. As our results below show, the data support this supposition.

I.C. The Mismatch between Time Series and the Cross-Sectional Patterns of the Inequality–Mobility Relationship

The descriptive evidence on the relationship between income inequality and mobility presents something of a paradox. As we have described, there is a relationship in the cross section, but there does not seem to be a similar relationship across time. The overall rate of income inequality in the United States has generally been rising since the 1970s. If inequality causally led to a decrease in mobility, one would expect to see the increase in income inequality begin to appear in mobility trends at some point. In terms of our earlier discussion, one might expect continuing increases in income inequality over many years to eventually change the economic and cultural landscape in a way that would lead to an erosion of social mobility. However, recent evidence from Chul-In Lee and Solon (2009), using

Figure 2. Trends in Mobility and Inequality in the United States, 1971–2014



Sources: Chetty and others (2014b); Lee and Solon (2009); Ruggles and others (2015).

a. Measured on the right vertical axis. The horizontal axis reflects the year in which income is measured.

b. Measured on the left vertical axis. The measure of mobility reflects regression estimates of the child's income rank at age 30 on the parent's income rank. The horizontal axis reflects the child's birth cohort year. Data for the 1983–93 cohorts are forecasts. See Chetty and others (2014b, figure 2).

c. Measured on the left vertical axis. The measure of mobility reflects regression estimates of intergenerational income elasticity for sons. The horizontal axis reflects the year in which the son's income was recorded. See Lee and Solon (2009, figure 1).

the Panel Study of Income Dynamics, and from Chetty and others (2014b), using linked parent/child tax records, shows no reduction in social mobility in recent decades. Though this evidence is not the final word on the matter, and critics have pointed out limitations, the finding that economic mobility does not appear to have fallen raises the question of whether inequality and mobility are causally linked after all.

These facts are documented in figure 2, which reports trend data on social mobility from Chetty and others (2014b) and Lee and Solon (2009), along with the trend in two measures of income inequality in the United States: the 90/50 ratio and the 50/10 ratio (which reflect ratios of different percentiles of the income distribution). For the 90/50 and 50/10 ratios, the horizontal axis in figure 2 reflects the year in which income is measured. For the mobility measure taken from Chetty and others (2014b), year reflects birth cohort; for the mobility measure taken from Lee and Solon (2009), year reflects the year in which the son's income was recorded.

Neither of the two mobility measures shows any obvious trend in economic mobility in recent decades. In terms of income inequality, the top of the distribution has been pulling away from the middle. As shown in the figure, the 90/50 ratio has risen almost continuously for the past several decades. However, lower-tail inequality, as captured by the 50/10 ratio, has been roughly flat in recent decades. If our supposition is correct that lower-tail inequality is more relevant to mobility than upper-tail inequality, this could help reconcile the apparent puzzle of rising income inequality and flat economic mobility. The fact that the 50/10 ratio is flat aligns with the flat mobility profile.

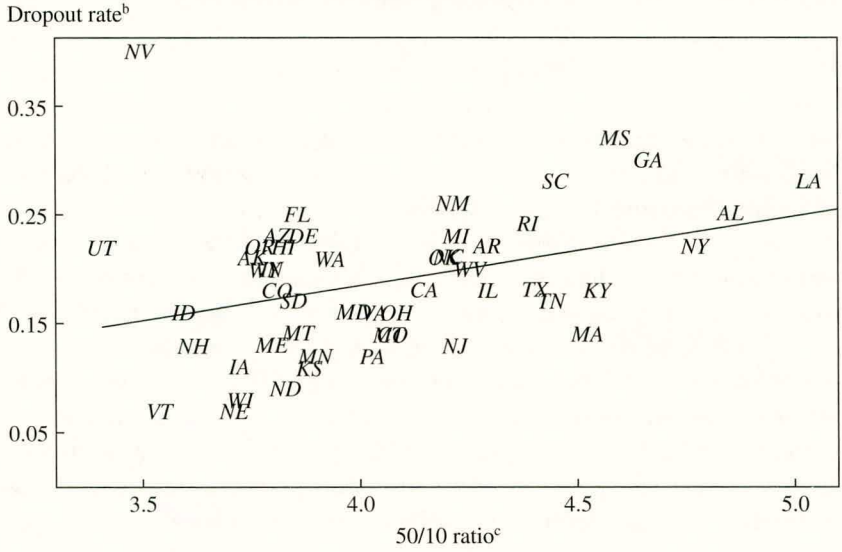
I.D. Income Inequality's Relation to High School Dropout Rates

Though there is a vast economics literature examining potential explanations for the rise of income inequality during the past four decades, there remains an important need for more research on its social consequences. This is precisely what we are interested in exploring. In this paper, we are focused on whether there might be negative effects on educational outcomes for children born into low-income homes, which would then have implications for upward mobility. We start by looking at the aggregate relationship, just to see what that the correlational relationship looks like.

Aggregate data show that places with higher levels of income inequality have lower high school completion rates. Figure 3 displays this relationship across states. For the reasons given above, we focus on a long-term average measure of income inequality. We construct the 50/10 ratio for each state in each of the 1980, 1990, and 2000 censuses, and we use the average across census years. We then compare this state-level measure with the state-level "dropout rate," which is 1 minus the four-year graduation rate. The correlation in these data is strong: Places with higher levels of income inequality tend to have higher dropout rates. One-quarter or more of those who start high school in Louisiana, Mississippi, Georgia, or the District of Columbia fail to graduate in a four-year period, as compared with fewer than 10 percent in Vermont, Wisconsin, North Dakota, and Nebraska. Lower-tail inequality is much greater in the former group of states.

Of course, many other things might be driving this relationship, including differences in the underlying characteristics of individuals living in these locations, so this is only meant to raise the possibility of a causal relationship; the plotted relationship can only be interpreted as correlational at this point. Our empirical analysis relies on individual-level data, so we are able to empirically control for individual-level demographic

Figure 3. The Relationship between Inequality and Rate of High School Noncompletion[a]



Sources: Stetser and Stillwell (2014); Ruggles and others (2015).
a. The District of Columbia is omitted from the figure because it is an outlier on the horizontal axis (5.66).
b. The dropout rate is the proportion of high school freshmen who do not graduate in four years.
c. Higher values indicate greater inequality.

characteristics as well as aggregate-level differences across places. This allows us to pursue an empirical investigation of whether there is a causal link between aggregate-level income inequality and individual-level educational attainment.

II. Motivating Framework: Modeling the Decision to Stay in School

Before turning to our empirical investigation, we present a simple theoretical model that is intended to spur asking the question of why higher levels of income inequality might increase the likelihood of dropping out of high school for those at the bottom of the income distribution.

II.A. A Stylized Model of the Decision to Drop Out of School

Here we offer an extremely stylized model of the decision to remain in school. This model is a straightforward adaptation of the model we laid out in Kearney and Levine (2014) to describe the decision of young, unmarried

women to delay childbearing. An individual chooses to drop out of school in the current period if the following condition is met:

$$u^d + E(V^d) > u^e + E(V^e), \tag{1}$$

where u^d is current-period utility if the student drops out, and u^e is current-period utility if he or she remains enrolled. V is the present discounted sum of future period utility; we assume that $E(V^e) > E(V^d)$.

If $u^d < u^e$, it is never optimal to drop out. But if $u^d > u^e$, which would be the case if the student experiences substantial utility costs from remaining in school (for example, psychic costs), then that current-period utility boost needs to be compared with the potential option value lost. Dropping out of school negatively affects expected future utility by leading to lower levels of consumption in the future. For simplicity, we characterize utility in future periods as taking high and low values, U^{high} and U^{low}, respectively. We assume that dropping out reduces the likelihood of achieving U^{high}. We define U^{low} to be the level achieved by a student who does drop out. The present discounted value of the future utility stream is thus deterministic and is captured by V^{low}. If the adolescent remains enrolled, there is some positive probability p that he or she will achieve the high utility position, U^{high}, in future periods.

We can therefore write the condition to drop out of school as

$$u^d + V^{low} > u^e + pV^{high} + (1 - p)V^{low}. \tag{2}$$

This condition indicates that the change in lifetime utility from staying in school comes from two opposite-signed sources: (i) the loss of current-period enjoyment for staying in school and having restricted time for leisure and other activities, and (ii) a positive probability of achieving the high-utility state in the future. Rearranging terms, we see that a student will choose to remain enrolled if and only if

$$[pV^{high} + (1 - p)V^{low}] - V^{low} > u^d - u^e. \tag{3}$$

Of course, the student does not perfectly observe p (Manski 1993). Instead, the student bases the decision on his or her perception of p, in particular, on his or her perception of his or her individual-specific p. Let us call this subjective probability of one's individual likelihood of success conditional on investment q. We would expect—though it need not be the case—q to vary positively with actual returns, as captured by p. So, for

example, increases in the actual return on investment in schooling would lead to a greater perception of returns. However, there are external factors—call them x—that affect an individual's perceptions of his or her own likely returns from staying in school. These external factors could reflect influences throughout childhood or at any stage in a child's life.

For example, students who know few others who went to college may incorrectly assume that they would not benefit from college—"It's not for people like me." In other words, for a given level of p, students of different socioeconomic backgrounds may differ in their individual value of q. In essence, we can think of q as a function of p and x; $q = q(p,x)$. It is not our intention to empirically distinguish between the separate roles played by p and x. Rather, we want to raise this conceptual possibility and note that income inequality might have an effect on perceived returns q, either through an effect on p or x.

Incorporating this discussion, we can rewrite the condition for deciding not to drop out as

$$[qV^{high} + (1-q)V^{low}] > V^{low} + (u^d - u^e). \tag{4}$$

If an adolescent perceives that he or she has a sizable chance of achieving economic success—and thereby capturing V^{high}—by investing in education, the comparison is more likely to favor the choice to stay enrolled. Conversely, if the student perceives that even if he or she stays enrolled, his or her person-specific chances of economic success are sufficiently unlikely—in other words, if q is very low—then the comparison is more likely to favor dropping out in the current period.

Rearranging expression 4, we can define a reservation subjective probability, q^r, such that an individual will stay enrolled in school if and only if

$$q \geq q^r = \left(\frac{u^d - u^e}{V^{high} - V^{low}} \right). \tag{5}$$

We propose that one's perception of the likelihood of economic success, q, increases in socioeconomic status, SES, such that $\frac{dq}{d(SES)} > 0$. Sakiko Ikoma and Markus Broer (2015) provide suggestive evidence that is consistent with this proposition based on tabulations of the nationally representative High School Longitudinal Survey. They report that the overwhelming majority of 9th graders aspire to go to college, but by 11th grade, low-SES students are substantially less likely to expect they

will enroll in college, even among those students with high test scores. Their drop-off in aspirations and expectations is substantially greater than among comparable high-SES students with similar test scores.

We additionally propose that one's perceived probability of success, q, is a function of the interaction between being of low SES and inequality, *ineq*, such that if the individual is of low SES, $\frac{dq}{d(ineq)} < 0$. This last proposition says that for an adolescent near the bottom of the income distribution, a greater gap between one's position and the middle of the distribution might have a negative effect on one's subjective q. If the experience of the middle class is sufficiently far from one's own experience, then the student's perceived returns from staying in school are low. Our main goal with the empirical analyses of this paper is to determine whether there does appear to be an effect of income inequality on dropout rates, conditional on rates of disadvantage and other relevant features of the aggregate environment. A secondary goal is to explore potential mechanisms that would be consistent with this line of inquiry, but we do not purport to exhaustively test for potential channels.

This framework has important implications for how to conduct our empirical analysis in terms of the appropriate level of geography. The way we are thinking about the possible effects of income inequality implies that the appropriate unit is a fairly broad area, such as a state or a metropolitan statistical area (MSA). These would allow for the effects of any type of residential or institutional segregation that might occur as a result of widened income inequality and would affect perceptions of success. If we were motivated by relative deprivation theories based on more localized comparisons, we would instead want to define income inequality much more locally.

II.B. Income Inequality, Socioeconomic Status, and Lifetime Income

The discussion above raises the question of whether low-SES youth from more unequal places actually do have a lower chance of earning higher levels of income later in life. Note that our framework does not require this to be the case, because an adolescent's decision is determined by $q(p,x)$, not just p, but it is still an interesting and relevant question to pursue. We offer two pieces of supporting evidence suggesting that this is indeed the case.

First, in Kearney and Levine (2014) we examine data from the restricted-use 1979 National Longitudinal Survey of Youth (NLSY79) geocoded

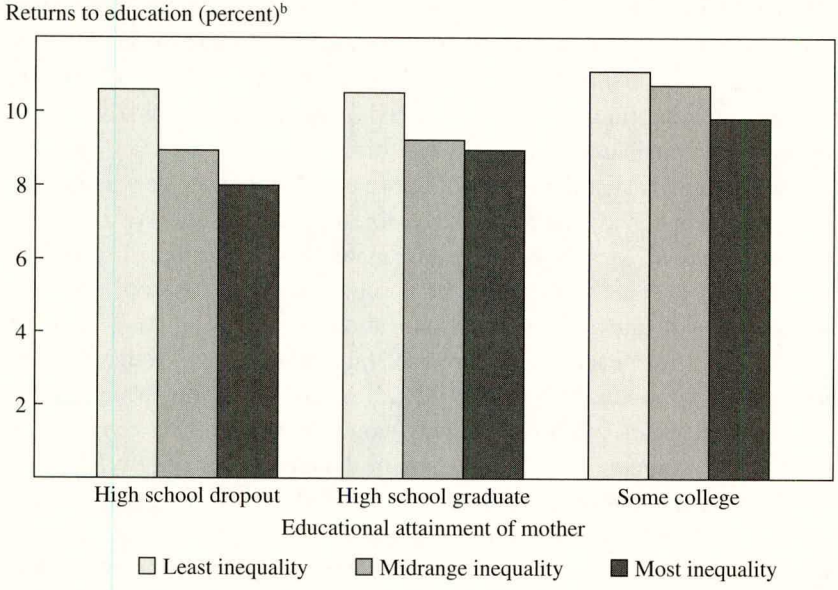
data.[7] We find that children who grow up in low-SES households and who live in a state with high lower-tail income inequality are estimated to have permanent incomes that are more than 30 percent lower than similar children in low lower-tail inequality states (high- and low-inequality states are distinguished by a 1-point increase in the 50/10 ratio). If perceptions of economic success are gauged on actual outcomes, then these findings are consistent with our proposition.

Second, here we estimate rates of return on education to see whether the return is lower for low-SES youth in more unequal places. We are using the term "return" loosely here, as this analysis is not designed to isolate a causal effect. This is meant to be a suggestive exercise, not a definitive analysis of rates of return on education. Again using data from the NLSY79, we track each respondent's average hourly wage from his or her primary job between 1998 and 2012 (all in 2015 dollars), which corresponds to the years when respondents would have been between ages 34 and 55. We estimate regression models of the natural log of hourly wages on educational attainment (as measured in years) and demographic characteristics (race or ethnicity, gender, and age) separately by SES (as captured by the mother's educational attainment category) and state-level income inequality (low, medium, and high).

The results, reported in figure 4, indicate that among individuals living in low-inequality states, the estimated rate of return from an additional year of schooling is roughly constant across SES categories, averaging roughly 10.5 percent. The estimated rate of return is lower, on average, for youth from all SES categories in high-inequality states. However, that reduction in the rate of return is especially pronounced among low-SES children (those whose mothers dropped out of high school). Individuals born to low-SES mothers in high-inequality states see a roughly 8 percent rate of return to education, as compared with 10.6 percent for low-SES youth in less-unequal states. To the extent that adolescents are basing their perceived likelihood of achieving economic success on actual rates, these data are consistent with a diminished perception of success among low-SES youth in more-unequal places.

7. We distinguish youth respondents by their parents' educational attainment and define "permanent income" to be the average of all inflation-adjusted values of family income observed 15 or more years after the original 1979 survey, when youth respondents are in their late 20s or older. The sample used in that exercise includes all 8,226 respondents who lived with at least one of their parents at age 14 and who provided any income values in the 1994 survey or beyond. We assign the level of inequality to each respondent based on the respondents' 1979 state of residence.

Figure 4. The Rate of Return from an Additional Year of Education, by Mother's Level of Education and State Income Inequality[a]



Sources: National Longitudinal Survey of Youth, 1979; Kearney and Levine (2014).
a. State income inequality is measured by the 50/10 ratio.
b. Return to education is the percent increase in wages from an additional year of educational attainment for the student.

II.C. Related Conceptual Models

Our model is related to a set of models that emphasize the role of one's relative position in society in determining individuals' attitudes and behaviors. An influential theory in social science posits a role for relative deprivation—as distinct from absolute deprivation—in leading to acts of social unrest. In the economics literature, Erzo Luttmer (2005) conducts an empirical investigation of this idea and documents that people are less happy when they live around other people who are richer than themselves. In the field of psychology, Mesmin Destin and others (2012) provide evidence that students who perceive themselves to be of lower social status (within a high school setting) suffer worse emotional distress, which has negative consequences for their academic performance. The authors conclude that "students' perception of their location on a relevant social hierarchy is related to their emotional state, academic behaviors, and academic achievement in such a way that it could reinforce the stability of their current location on the hierarchy" (Destin and others 2012, p. 1578). Along these lines, the relative position of individuals could lead to feelings of

alienation from society that in turn lead them to want to engage in rebellious types of behaviors, perhaps including dropping out of school.

Garance Genicot and Debraj Ray (2014) propose a theoretical model that leads to the same prediction as our "economic despair" model. Their model proposes that society-wide economic outcomes affect individual aspirations. Aspirations that are slightly above one's position lead to increased human capital investment; but if aspirations get too far from one's current position, that could lead to frustration and lower levels of human capital investment.

Tara Watson and Sara McLanahan (2011) present evidence that relative income matters for the marriage decision of low-income men. They interpret their model within the framework of an identity construct, based largely on the identity model developed by George Akerlof and Rachel Kranton (2000). Specifically, Watson and McLanahan (2011) hypothesize that individuals perceive a threshold income required for marriage, and that this threshold is influenced by an individual's local reference group. One could imagine an extension of this theory that applies to educational attainment. Perhaps individuals perceive a threshold type of person who completes higher levels of education; youth at the bottom of the income distribution in more unequal places may be more likely to view themselves as the low achievers in their reference group.

All these perspectives describe a potential mechanism linking high inequality to lower rates of high school completion. They are useful because they offer a conceptual framework for thinking about the issue, and a useful framework to guide the empirical analysis and interpretation of results. We are ultimately unable to perform a rigorous econometric examination of this hypothesis, however, because reliable measures of perceptions and attitudes with detailed demographic and geographic information are not available to us.

III. The Empirical Strategy

The preceding discussion provides insight regarding a potential mechanism between income inequality and educational outcomes for economically disadvantaged youth. In this section we present the methods and data we use to examine this relationship.

III.A. Our Empirical Approach

The goal of our econometric analysis is to determine whether individuals from disadvantaged backgrounds who live in areas with high rates of income inequality experience greater high school dropout rates. We

estimate individual-level regressions that model an individual's educational outcome as a function of individual-level characteristics (including SES), state and year fixed effects, and, crucially, the interaction of SES and the level of inequality in the place where this individual lives. It is this interaction term that gives us the main coefficient of interest and indicates whether low-SES youth in high-inequality locations are relatively more likely to drop out of high school.

The formal econometric model takes the following form:

$$(6) \quad Outcome_{isc} = \beta_0 + \beta_1 (I_s \cdot LS_{is}) + \beta_2 (I_s \cdot MS_{is}) + \beta_3 LS_{is} + \beta_4 MS_{is} + \beta_5 X_{isc} + \beta_6 E_{sc} + \gamma_s + \gamma_c + \varepsilon_{isc},$$

where the outcome is some measure of educational attainment (mainly having dropped out of high school, but also GED attainment or high school graduation in some specifications), I is our measure of income inequality, and LS and MS are indicators of low and middle SES, respectively. The subscripts i, s, and c index individuals, states, and birth cohorts, respectively; and γ_s and γ_c represent state and cohort fixed effects. Cohort variation comes from the different data sets. The vector X consists of additional personal demographic characteristics—gender, race or ethnicity, and an indicator for living with a single parent at age 14. The vector E captures environmental factors, including relevant public policies and labor market conditions in the state and year in which the respondent was age 16.[8] We have specified this model focusing on state-level variation, but we also consider variation at the MSA level.

8. These variables include the state unemployment rate at age 16, the state minimum wage, state education policies (compulsory schooling age and indicators for high school exit exam requirements), state welfare policies (family cap and maximum benefit from Aid to Families with Dependent Children or Temporary Assistance for Needy Families for a family of three), state abortion policies (Medicaid funding, parental notification/consent, and mandatory delay laws), and an indicator variable for State Children's Health Insurance Program implementation and Medicaid family planning waiver implementation. Information on exit exam requirements by state and year is taken from Dee and Jacob (2007) and Dietz (2010). Information on compulsory school laws by state and year is obtained from the National Center for Education Statistics' "Digest of Education Statistics" (various years; https://nces.ed.gov/programs/digest). Detailed source information and notes about the construction of the other variables in this list are provided in Kearney and Levine (2012). We have also experimented with interacting all the policy variables with SES indicators and found that the results were unaltered by doing so. In addition, we include dummy variables indicating the data set that the observation came from.

It is important to note that our measure of income inequality is a long-run average (not subscripted by c), so we are estimating the impact of persistent differences in inequality, not transitory differences. This contrasts with a more typical panel data approach exploiting transitory variation in the explanatory variable of interest. For example, Susan Mayer (2001) uses the 1993 data from the Panel Study of Income Dynamics to exploit variation over time in state-level income inequality, as measured by the Gini coefficient, to investigate whether levels of income inequality by state and year affect individual-level educational outcomes. In her regression models, which include both state and year fixed effects, there is no evidence of a statistically significant relationship. We do not find this to be surprising, given that it would be quite remarkable for year-to-year fluctuations in income inequality to translate into changes in institutions, norms, or attitudes such that educational outcomes responded at such a fine interval of time.

The main shortcoming of this empirical strategy is that any omitted, state-specific factor that is fixed over time and correlated with long-term measures of income inequality may generate biased results if it has disproportionate effects on the educational attainment of low-SES youth. To determine whether potential confounders are playing this role, we estimate a series of "horserace" regressions of the following form:

$$
\begin{aligned}
(7) \qquad Outcome_{isc} = {} & \beta_0 + \beta_1 (I_s \cdot LS_{is}) + \beta_2 (I_s \cdot MS_{is}) + \beta_3 (A_s \cdot LS_{is}) \\
& + \beta_4 (A_s \cdot MS_{is}) + \beta_5 LS_{is} + \beta_6 MS_{is} + \beta_7 X_{isc} \\
& + \beta_8 E_{sc} + \gamma_s + \gamma_c + \varepsilon_{isc}.
\end{aligned}
$$

In essence, our approach involves including potential alternative state factors (A_s) that could plausibly affect the relative educational attainment of low-SES youth and examining whether the results change when we include them in the same manner in which we have included the inequality*SES interactions. If the coefficients on the interaction terms of primary interest change when we add the additional interactions between SES and these alternatives, then it would suggest that the results generated by equation 6 are biased estimates of the causal effect of inequality. It is impossible to rule out this form of bias unless we try including every possible alternative, but if what we believe to be important alternatives have no impact, then we can be more confident in a causal interpretation of our findings.

We consider four categories of these other state factors. The first set of factors addresses the measurement of income inequality. As noted above,

we use the 50/10 ratio as our primary measure of inequality. In our past work on early, nonmarital childbearing, we found that the 50/10 ratio was the most empirically relevant measure for determining rates of early, nonmarital childbearing. However, we recognize that there are reasons why upper-tail inequality might be particularly important for educational outcomes. We empirically explore the impact of including the 90/50 ratio, as well as the 10th and 50th percentiles of the income distribution on their own.[9]

The second set of alternative factors we consider are measures of the wage returns on investment in education. This is important because it enables us to identify the incentive effect of higher returns (as in a standard Becker model) separately from any offsetting discouragement effect of the type we propose. Third, we consider a set of alternatives that could be considered mediating factors to determine the mechanism whereby increased inequality alters educational attainment. Fourth, we include a set of potential confounding factors that might lead to omitted variable bias if not explicitly interacted with SES and included in the model. A final set of regressions is estimated to determine the extent to which differences in distributions of underlying ability would alter the interpretation of our findings.

III.B. The Data

To estimate these models, we use five sources of individual-level data. Three of these sources are obtained from the National Center for Education Statistics—the National Educational Longitudinal Survey (NELS), High School and Beyond (HSB), and the Educational Longitudinal Survey (ELS)—and the other two are the 1979 and 1997 cohorts of the National Longitudinal Survey of Youth (NLSY79 and NLSY97).[10] Each of these data sets has the distinct advantage of including detailed measures of

9. A possible concern is that inequality ratios are driven by persistent high school graduation rates in a place, which would induce an endogeneity problem with this specification. To address that possibility, we reran our regression analyses with 50/10 ratios constructed just among high school graduates. This analysis yielded similar findings to those reported below.

10. For all data sets other than High School and Beyond, geographic identifiers are only available for those with restricted-use data agreements. This means that we are not able to share our data with other researchers, although we are happy to provide our programs so that those who are able to obtain their own agreement can follow our steps. Formal state identifiers are not available at all for High School and Beyond, but researchers, such as Grogger (1996), have identified ways to provide educated guesses of state of residence for survey respondents. We are grateful to Jeff Grogger for providing us with his data indicating state identifiers for these data.

educational attainment, including the ability to separately identify those who receive a degree by passing a GED test and those who receive a traditional high school degree. Their combination also generates a sample of tens of thousands of teenagers who are moving through (or just recently completed) their high school years. NLSY79 originally surveyed 12,686 respondents born between 1957 and 1964 (ages 14–22 in 1979). HSB originally surveyed more than 30,000 high school sophomores in 1980, of whom about 15,000 were invited to participate and 13,682 did so in the second follow-up four years later.[11] We measure high school completion in that year. NELS surveyed 14,915 8th graders in 1988 who were also surveyed in 1994, when we can determine whether they completed high school. NLSY97 surveyed 8,984 respondents born between 1980 and 1984 (ages 12–18 in 1997). ELS surveyed 15,300 10th graders in the spring of 2002; and these same students were also surveyed in 2006, when high school completion could be measured. In combination, a maximum of 65,567 respondents are available. In reality, mainly because of missing state identifiers, missing information regarding SES (defined below as level of maternal education), and sample attrition, we have available 53,150 teens for our analysis.[12] Limited time variability is available when we combine these data sets, but our analysis relies on long-term geographic variability, as we described above.

A critical feature of these data, as captured in our econometric models, is a measure of the youths' SES. The measure that is available in each of these data sets is the mother's level of education. We distinguish students according to whether their mother dropped out of high school, graduated from high school, or attended college (regardless of her graduation status). Although maternal education does not perfectly predict economic status, we take advantage of the fact that it is strongly correlated with SES.

Although the availability of all five of these data sets provides a unique opportunity to generate a large sample of high school students and to follow them through the completion (or not) of their degree, their combination also presents challenges. In particular, identifying a consistently selected sample and outcome measure is somewhat complicated. Sample selection

11. This survey also included more than 28,000 high school seniors in 1980, but we do not use them because many high school dropouts never make it to be seniors in high school; using these data would introduce substantial selection bias.

12. Sample attrition reduces the sample size to 61,067. Missing educational attainment reduces it further to 59,286. Missing maternal education brings the final sample size down to 53,150.

is an issue because individuals entered the samples at different ages and grades. For instance, the NELS initially surveyed 8th graders and the ELS and HSB initially surveyed 10th graders. Survival in high school until 10th grade represents a degree of success that changes the composition of the sample because more poorly performing students may drop out before they make it to 10th grade. We discuss issues like these in the online data appendix.[13] We account for this in our econometric specification by including data set dummy variables, which we have labeled in the model as cohort fixed effects, given that data sets identify cohorts. We focus on three consistent measures of educational attainment across data sets. In each of these data sets, we are able to determine (i) whether a student completed high school and received a traditional diploma, (ii) whether a student received a GED, or (iii) whether a student never obtained a high school degree via either route.

Our measures of income inequality are defined over pretax, posttransfer household income using micro data from the 1980, 1990, and 2000 censuses. These data sets are available from the Integrated Public Use Microdata Series database (known as IPUMS-USA; Ruggles and others 2015); they capture details of the income distribution over a comparable period as our micro-level data sets. We take one observation per household, adjust the data for inflation to denominate dollars in a common year, calculate relevant percentiles of the income distribution (unweighted), and then define state- and year-level income inequality ratios (50/10 and 90/50) based on these data.[14] We exclude those residing in group quarters, but we impose no other sample restrictions.

We then take the long-term average over all years for a state. As we described above, we take this approach because we are trying to capture something about the permanent or semipermanent economic and cultural landscape in the place where an adolescent lives, as opposed to short-term fluctuations. Simple correlations across states in state-level income

13. The online appendixes for this and all other papers in this volume may be found at the *Brookings Papers* web page, www.brookings.edu/bpea under "Past Editions."

14. Total household income in the census is defined as the sum of eight categories: (i) wages, salary, commissions, bonuses, or tips from all jobs; (ii) self-employment net income; (iii) interest, dividends, net rental income, royalty income, or income from estates and trusts; (iv) Social Security or Railroad Retirement Board benefits; (v) Supplemental Security Income; (vi) any public assistance or welfare payments from the state or local welfare office; (vii) retirement, survivor, or disability pensions other than Social Security; and (viii) any other sources of income received regularly, such as Veterans Affairs payments, unemployment compensation, child support, or alimony.

ratios between the three censuses are high, supporting this approach. For instance, the correlation across states in the 50/10 ratio between 1980 and 1990 and between 1980 and 2000 are .81 and .74, respectively. Correlations in the 90/50 ratio are even higher. Moreover, the 50/10 ratio has been largely stable over time, as simple transformations from published Census Bureau data indicate.[15]

IV. The Empirical Results

The preceding discussion established the tools we use to examine the relationship between income inequality and educational attainment. This section provides the initial results from this analysis.

IV.A. Descriptive Analysis

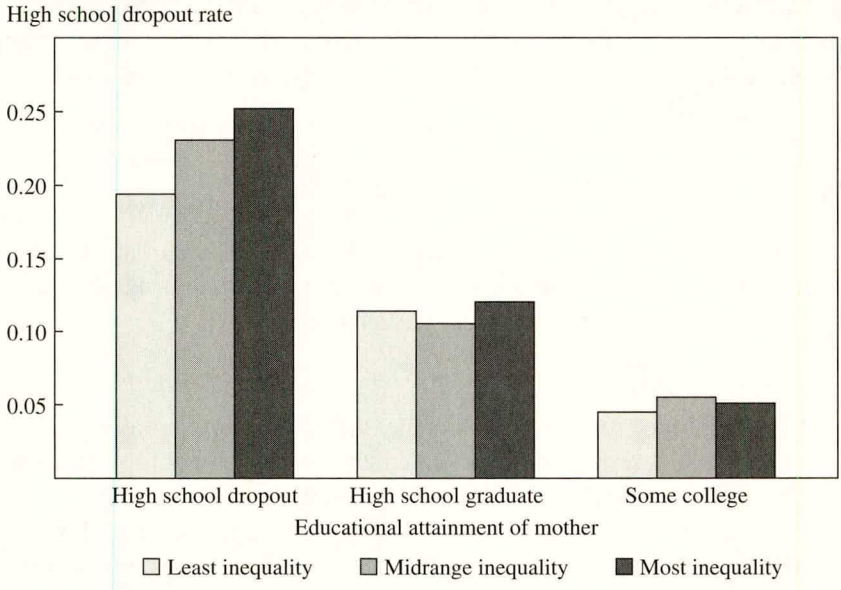
To highlight the identification strategy that we use, we initially present the results of a descriptive analysis of educational outcomes for teenagers by their SES and the level of income inequality that exists in their state. Figure 5 presents the results of this descriptive analysis. Foreshadowing the results from our subsequent formal econometric analysis, we present these results just for boys. We classify states into those in the top, bottom, and middle two quartiles of inequality as measured by the 50/10 ratio.[16] The bars represent the percentage of boys who dropped out of high school. Boys are separated into categories according to their mother's educational attainment to proxy for SES, along with the level of inequality that exists in their state.

Figure 5 groups SES categories so that the pattern in educational outcomes by inequality status within SES category is readily apparent. We see that about 5 percent of boys from higher-SES families drop out of high school regardless of the level of income inequality in their state. No

15. For the relevant percentiles necessary to construct the income ratios, see U.S. Census Bureau, table IE-1, "Selected Measures of Household Income Dispersion" (https://www.census.gov/hhes/www/income/data/historical/inequality).

16. States fall into the following categories, with the 50/10 ratio in parentheses. Low inequality: UT (3.40), NV (3.49), VT (3.54), ID (3.59), NH (3.61), NE (3.71), IA (3.72), WI (3.72), AK (3.75), OR (3.77), WY (3.78), ME (3.80), IN (3.80). Middle inequality: CO (3.81), AZ (3.81), ND (3.82), HI (3.82), SD (3.84), FL (3.85), MT (3.86), DE (3.87), KS (3.88), MN (3.90), WA (3.92), MD (3.98), VA (4.03), PA (4.03), CT (4.06), MO (4.07), OH (4.08), CA (4.15), OK (4.19), NC (4.19), NM (4.21), NJ (4.22), MI (4.22), WV (4.25), AR (4.28). High inequality: IL (4.29), RI (4.38), TX (4.40), TN (4.44), SC (4.45), MA (4.52), KY (4.54), MS (4.59), GA (4.66), NY (4.77), AL (4.85), LA (5.03), DC (5.66).

Figure 5. The High School Dropout Rate for Boys, by Mother's Level of Education and State Income Inequality[a]



Source: Ruggles and others (2015).
a. State income inequality is measured by the 50/10 ratio.

obvious pattern is evident among the middle-SES boys in different inequality categories either. Among low-SES boys, however, higher inequality is clearly associated with higher rates of dropping out of high school. The magnitude of the difference is sizable. Low-SES boys in high-inequality states are almost 6 percentage points more likely to drop out of high school than low-SES boys in low-inequality states.

IV.B. State-Level Analysis

These findings from our descriptive analysis are confirmed when we estimate the regression models described in equation 6. In essence, these regressions are analogous to the data reported in figure 5, with the exception that the 50/10 ratio is treated continuously rather than in categories and additional explanatory variables are included. Table 1 presents these results for all students in the sample and then separately for boys and girls.[17] Each

17. We have also estimated these models separately by race and ethnicity, but the data were not sufficiently powerful to yield statistically significant differences across groups.

Table 1. The Impact of Long-Term Inequality, by State, on Educational Attainment by Age 20, by Socioeconomic Status and Gender[a]

	(1) *High school dropout*[b]	(2) *GED attainment*	(3) *High school graduate*
		All	
Percent in category	*10.1*	*4.8*	*85.1*
50/10 ratio * mom is high school dropout	0.023	−0.006	−0.017
	(0.015)	(0.010)	(0.016)
50/10 ratio * mom is high school graduate	0.018	0.010	−0.028
	(0.014)	(0.008)	(0.013)
		Boys	
Percent in category	*11.2*	*5.5*	*83.3*
50/10 ratio * mom is high school dropout	0.041	−0.018	−0.022
	(0.015)	(0.015)	(0.018)
50/10 ratio * mom is high school graduate	0.025	0.013	−0.037
	(0.017)	(0.009)	(0.016)
		Girls	
Percent in category	*9.1*	*4.1*	*86.8*
50/10 ratio * mom is high school dropout	0.007	0.005	−0.012
	(0.019)	(0.010)	(0.022)
50/10 ratio * mom is high school graduate	0.009	0.006	−0.015
	(0.014)	(0.011)	(0.016)

Sources: National Educational Longitudinal Survey; High School and Beyond; Educational Longitudinal Survey; National Longitudinal Survey of Youth, 1979 and 1997.

a. Additional explanatory variables in each regression include maternal educational attainment, gender, race or ethnicity, an indicator variable for living with a single parent at age 14, the state unemployment rate at age 16, the state minimum wage, state education policies, state welfare policies, state abortion policies, indicator variables for State Children's Health Insurance Program implementation and Medicaid family planning waiver, and state and cohort fixed effects. See the text for specific state education, welfare, and abortion policies. Standard errors in parentheses are clustered by state. The total sample size is 53,150, with 25,816 boys and 27,334 girls.

b. The p value of a test comparing the equality of coefficients in column 1 by gender in response to a change in the interaction between the 50/10 ratio and mom is high school dropout is 0.086.

column isolates a different measure of educational outcomes: high school dropout, GED attainment, and high school graduation. The percentage of students in each category is displayed just above the regression results to aid in interpretation. When we focus on dropping out of high school for all students (top panel), we see that a 1-point increase in the 50/10 ratio increases the likelihood of dropping out by 2.3 percentage points for students from low-SES families. This estimate is not quite statistically significant, with a p value of 12.3 percent. When we explore differences in estimates by

Table 2. The Impact of Long-Term Inequality, by Metropolitan Statistical Area, on the Likelihood of Dropping Out of High School, by Socioeconomic Status and Gender[a]

	(1) *All*	*(2)* *Boys*	*(3)* *Girls*
Percent in category[b]	12.3	14.1	10.6
50/10 ratio * mom is high school dropout	0.036	0.073	0.002
	(0.013)	(0.018)	(0.016)
50/10 ratio * mom is high school graduate	0.020	0.028	0.009
	(0.011)	(0.016)	(0.012)

Sources: Educational Longitudinal Survey; National Longitudinal Survey of Youth, 1979 and 1997.

a. Additional explanatory variables in each regression include maternal educational attainment, race or ethnicity, an indicator variable for living with a single parent at age 14, and MSA and cohort fixed effects. The p value of a test comparing the equality of coefficients by gender for high school dropout mothers is 0.0004. Standard errors in parentheses are clustered by MSA. The total sample size is 22,304, with 11,042 boys and 11,262 girls.

b. High school dropouts as a percent of the total sample.

gender, however, we see that boys in particular are more likely to drop out of high school when they grow up in a low-SES household in an area marked by high inequality. Moving from a relatively low-inequality to high-inequality state represents a 1-point increase in the 50/10 ratio. This means that making such a move for a boy from a low-SES family increases the likelihood of dropping out of high school by age 20 by 4.1 percentage points. The analogous estimate for girls is considerably smaller, statistically insignificant, and marginally significantly different than the estimate for boys (p value = 8.6 percent). Estimates for the other two outcomes (receiving a GED or graduating from high school) are too imprecise to determine whether the increase in dropping out for boys came mainly from either of them.

IV.C. MSA-Level Analysis

In the next set of regressions, we examine what happens if we run the main analysis at the level of an MSA, instead of state. For some large states, such as California and Texas, the MSA may be the more relevant level of geographic boundaries for defining economic conditions and institutions.

Table 2 focuses on the outcome of dropping out of high school, and it repeats the analysis of the impact of inequality and mobility by MSA rather than state. The models reported here are analogous to those in table 1 except that these regressions exclude policy variables set at the state level. Omitting these variables from the state-level models has virtually no

impact on the results. We are also forced to omit the NELS and HSB data from our analysis because we are not able to identify geography below the state level in the base year in these data sets. MSA-level results are similar to state-level results. Lower-SES teens, and particularly boys, who grow up in MSAs with greater lower-tail income inequality are considerably more likely to drop out of high school. The p value for the gender difference in effects on dropping out of high school is 0.0004. The general pattern in the data, which shows that boys' dropout rates are more likely to be affected by inequality than girls' rates, leads us to focus the remainder of the analysis on boys. We also focus the remainder of our reported results solely on the outcome of dropping out of high school.

V. An Examination of Potential Explanations

In the next set of tables, we estimate models of the form of equation 7 that are designed to examine the extent to which other state-specific factors may matter, and we revise our interpretation of a causal impact of income inequality. In each of these tables, to facilitate comparison, we also include the results of our base specification from table 1 in the first column.

V.A. Alternative Measures of the Income Distribution

Table 3 reports the results of estimating the main equation of interest using various measures of the income distribution. The alternatives we consider are the 90/50 ratio; the 10th and 50th percentiles of the income distribution, separately; and the share of income going to the top 1 percent of households. Data on the share of income going to the top 1 percent of households were obtained from an online appendix to Chetty and others (2014a). Those data are available at the level of commuting zones, and we aggregated them to the state level. Each of the alternative measures of the income distribution captures different attributes. The 90/50 ratio represents income inequality at the top of the income distribution. This is the part of the distribution that has grown over time. We have argued that the 50/10 ratio is a better measure of inequality for the low-SES population because it may more realistically indicate what would be available to them if they were able to move up the ladder; but this is an empirical question. We also include the 10th and 50th percentiles of the income distribution separately to enable us to understand whether our findings based on their ratio are actually attributable to one of the two components separately. The

Table 3. The Impact of Alternative Income Distribution Measures on Boys' Likelihood of Dropping Out of High School, by Socioeconomic Status[a]

	(1) *50/10 ratio*	*(2)* *90/50 ratio*	*(3)* *10th percentile of income distribution*[b]	*(4)* *50th percentile of income distribution*[b]	*(5)* *Income share of the top 1 percent of the distribution*
Correlation between 50/10 ratio and characteristic		0.67	–0.63	–0.20	0.38
50/10 ratio * mom is high school dropout	0.041	0.058	0.041	0.041	0.042
	(0.015)	(0.025)	(0.024)	(0.016)	(0.018)
50/10 ratio * mom is high school graduate	0.025	0.023	0.024	0.024	0.029
	(0.017)	(0.019)	(0.021)	(0.017)	(0.017)
State characteristic * mom is high school dropout	—	0.069	0.0002	–0.0001	–0.001
		(0.072)	(0.005)	(0.001)	(0.003)
State characteristic * mom is high school graduate	—	0.004	–0.001	–0.0003	–0.001
		(0.050)	(0.003)	(0.001)	(0.002)

Sources: National Educational Longitudinal Survey; High School and Beyond; Educational Longitudinal Survey; National Longitudinal Survey of Youth, 1979 and 1997.

a. See the notes to table 1. Interacted state characteristics are listed in the column headings.

b. Incomes are measured in ten-thousands of dollars.

income share going to the top 1 percent addresses the impact of very-high-end inequality.

As described above, we include the interaction of the 50/10 ratio and SES, along with interactions between SES and these other measures. The estimates reported in table 3 provide support for the notion that the 50/10 ratio is the relevant measure of income inequality for the outcomes of low-SES boys. Interactions with the other measures are generally statistically insignificant and have no impact on the estimated effect of the interaction between the 50/10 ratio and low SES. If anything, including the 90/50 ratio strengthens the relationship between the 50/10 ratio among low-SES boys and dropping out of high school.

V.B. The Role of Wage Inequality

Recall from our earlier discussion that if greater inequality reflects a greater return on investment in human capital, the Becker framework predicts that all else remaining equal, students should invest more when income inequality is greater. Solon (2004) formalizes this concept in a model where parents make human capital investments in their children.[18] Building on the theoretical foundation of Gary Becker and Nigel Tomes (1979), he shows that parental investment in a child's human capital increases when the payoff from that return is higher—that is, when there is more wage inequality. In our framework, this would entail a reduction in the likelihood of dropping out of high school.[19]

The specifications reported in table 4 address this possibility directly by considering a distinct offsetting role from the incentive effect of wage differentials. In column 2, we estimate a regression model that includes separate interaction terms for low SES with lower-tail inequality, and low SES with the wage premium for high school graduates relative to high school

18. We are agnostic as to whether this decision ultimately rests with the adolescent, his parent, or some combination thereof.

19. Although our analysis focuses on cross-sectional variation, our framework also yields some potential insights regarding trends in educational attainment over time. Despite the growing rate of return on education that has been taking place over time, the high school dropout rate has been roughly constant, until, perhaps, recently (Goldin and Katz 2010). According to our theoretical framework, increased educational incentives associated with higher educational wage premiums may be counteracted with a greater "desperation effect" associated with growing income inequality, generating an ambiguous prediction regarding educational attainment. As noted above, though, the 50/10 ratio has been relatively flat during the past few decades, which is consistent with generally unchanged rates of dropping out of high school in our framework.

Table 4. The Impact of Educational Wage Premiums on Boys' Likelihood of Dropping Out of High School, by Socioeconomic Status[a]

	(1) *50/10 ratio*	*(2)* *High school graduate to high school dropout wage premium*	*(3)* *College graduate to high school graduate wage premium*
Correlation between 50/10 ratio and characteristic		0.27	0.35
50/10 ratio * mom is high school dropout	0.041	0.046	0.037
	(0.015)	(0.015)	(0.017)
50/10 ratio * mom is high school graduate	0.025	0.023	0.022
	(0.017)	(0.018)	(0.019)
State characteristic * mom is high school dropout	—	−0.117	0.039
		(0.076)	(0.043)
State characteristic * mom is high school graduate	—	0.029	0.024
		(0.062)	(0.043)

Sources: National Educational Longitudinal Survey; High School and Beyond; Educational Longitudinal Survey; National Longitudinal Survey of Youth, 1979 and 1997.

a. See the notes to table 1. Interacted state characteristics are listed in the column headings.

dropouts. The high school graduate wage premium is calculated from the same census data that we used to estimate measures of inequality, except that the sample is restricted to those between ages 21 and 64.

The results of this specification indicate that, even with this additional interaction term in the model, the point estimate on the interaction term between low-SES and lower-tail inequality is virtually unchanged from the initial specification. The data indicate a positive effect of income inequality on the likelihood that a disadvantaged youth drops out of school, conditional on the high school wage premium. The high-school-graduate to high-school-dropout wage premium itself is estimated to reduce the likelihood of dropping out for low-SES boys, although it is insufficiently precise to be statistically significant.

V.C. Residential Segregation and Other Potential Mediating Factors

There are a number of pathways along which income inequality could hinder the educational attainment of disadvantaged students. In the introductory chapter of the edited volume *Whither Opportunity,* Greg Duncan and Richard Murnane (2011) discuss the possibility that income inequality

has an effect on neighborhoods, families, labor markets, and the educational system in ways that affect educational outcomes.[20] In this section, we empirically examine factors along these lines. We begin with measures of residential segregation. To the extent that higher income inequality is associated with increased residential segregation—as empirically demonstrated by Watson (2009)—this could be a pathway along which income inequality affects the educational attainment of disadvantaged youth. Greater residential segregation can affect social and labor market networks, the presence of high-achieving role models, and the establishment of peer groups and norms.

The influential work of William Julius Wilson (1987) emphasizes the role of "social isolation" in driving rates of urban joblessness and nonmarital childbearing. He hypothesizes that the lack of exposure to mainstream, middle-class role models plays an important role. Anne Case and Lawrence Katz (1991) provide an early example of nonexperimental empirical research, suggesting significant neighborhood peer effects for criminal behavior as well as the likelihood that youth are out of school and out of work. The widely studied Moving to Opportunity for Fair Housing demonstration program—run by the U.S. Department of Housing and Urban Development—was predicated on the notion that helping low-income families move out of high-poverty neighborhoods would yield measurable economic self-sufficiency benefits.[21]

To investigate neighborhood segregation as a mediating channel, we incorporate into our empirical model indexes of racial segregation, income segregation, and poverty segregation. To the extent that any of these factors, when interacted with SES, have a statistically significant effect or

20. Chetty and Hendren (2015) show that low-income children who move to a better neighborhood, as measured by the outcomes of those children already living there, experience improved outcomes themselves, with those moving at a younger age experiencing greater gains. They use methods including sibling differences and family fixed effects to provide statistical identification and they show that these childhood moves generate greater gains when their new community is characterized by less concentrated poverty, less income inequality, better schools, a larger share of two-parent families, and lower crime rates. This part of the analysis, however, does not attempt to determine which, if any, of these place-based characteristics have a causal relationship with child outcomes later in life. Nor does it attempt to figure out whether income inequality, per se, has a negative effect on the outcomes of low-income children, and if so, through what mechanisms.

21. We describe the findings of that experiment, and how they relate to our findings, in our discussion section below.

alter the estimated impact of the inequality*SES interactions, one could conclude that they are important mediating factors. We obtain the three segregation measures from the online data appendixes to Chetty and others (2014a, 2014b). The racial segregation measure is a multigroup Theil index calculated at the census-tract level for four groups: white alone, black alone, Hispanic, and other. The income segregation measure is calculated as a rank-order index by census tract using the definition laid out by Sean Reardon (2011).[22] The poverty segregation index captures the extent to which individuals in the bottom quartile are segregated from those in the top three quartiles. We have averaged these commuting zone measures up to the state level (population-weighted) for our state-level analysis. Thus, for example, a state like Texas (with highly segregated commuting zones) will be classified as highly income segregated, and Utah will not.

The results reported in table 5 provide no evidence of this sort of effect. None of the coefficients of the interactions with these factors in columns 2 through 4 are statistically significant, and their inclusion has a negligible impact on the inequality*SES interactions. The lack of support in the data for these factors is noteworthy, but we hasten to add that it should not be interpreted as definitive evidence against an important role for residential segregation in affecting the educational outcomes of poor youth. Rather, these regression results imply that the average level of segregation in the state is not driving the empirical relationship we find between state-level income inequality and individual-level education outcomes.

Another potential mechanism whereby income inequality might affect the dropout rates of low-SES youth is a reduced public provision of educational inputs. Political economy considerations of whether higher levels of income inequality would lead to lower levels of public goods provision (including public school expenditures) are actually ambiguous. More money in the hands of the rich could reduce transfers of resources to the

22. The income segregation measure captures the extent to which households of different income percentiles are evenly distributed among residential locations. For example, if 10 percent of a census tract is below the 10th percentile, that indicates no segregation at that level. The overall statistic essentially calculates this for all 100 percentiles and then aggregates up, putting more weight near the middle of the distribution where there should be more equality. The segregation index is maximized if and only if there is no variation in income within any neighborhood. The segregation index is minimized if and only if within each neighborhood, the income distribution is identical to that in the population. This Reardon (2011) measure has the desirable property that it is insensitive to rank-preserving changes in the income distribution.

Table 5. The Impact of Measures of Segregation on Boys' Likelihood of Dropping Out of High School, by Socioeconomic Status[a]

	(1) *50/10 ratio*	*(2)* *Racial segregation index*	*(3)* *Income segregation index*	*(4)* *Poverty segregation index*
Correlation between 50/10 ratio and characteristic		0.05	0.47	0.26
50/10 ratio * mom is high school dropout	0.041	0.040	0.040	0.037
	(0.015)	(0.017)	(0.016)	(0.017)
50/10 ratio * mom is high school graduate	0.025	0.025	0.025	0.024
	(0.017)	(0.015)	(0.017)	(0.017)
State characteristic * mom is high school dropout	—	0.0008	0.050	0.281
		(0.0008)	(0.396)	(0.496)
State characteristic * mom is high school graduate	—	−0.0008	0.0001	0.050
		(0.0004)	(0.204)	(0.260)

Sources: Chetty and others (2014a, 2014b); National Educational Longitudinal Survey; High School and Beyond; Educational Longitudinal Survey; National Longitudinal Survey of Youth, 1979 and 1997.

a. See the text and the notes to table 1. Interacted state characteristics are listed in the column headings.

poor. Alternatively, if the rich were to become more fearful about the poor agitating for social change, that could increase transfers. Furthermore, under the median voter model, with greater inequality, the median declines relative to the mean, and the preferences of the median voter for more distribution from the rich prevail. Recent empirical evidence on the relationship between income inequality and public revenue for school spending shows that public school spending increases as the level of local income inequality rises (Boustan and others 2013; Corcoran and Evans 2010; Gordon 2013). Nonetheless, we run the relevant regression to investigate public school expenditures as a mediating pathway.

Table 6 reports the results from a regression that includes the interaction of state-level 50/10 inequality and educational inputs. Educational inputs are measured by per-pupil educational expenditures and pupil/teacher ratios.[23] In our data, we see that per-pupil educational expenditures and pupil/teacher ratios are only weakly correlated with state-level lower-tail income inequality (.14 and −.23, respectively), making it unlikely that

23. We thank Elizabeth Cascio for generously sharing the historical data she compiled on per-pupil expenditures and pupil/teacher ratios.

Table 6. The Impact of Potential Mediating Factors on Boys' Likelihood of Dropping Out of High School, by Socioeconomic Status[a]

	(1) *50/10 ratio*	*(2)* *Per-pupil educational expenditure*[b]	*(3)* *Pupil/teacher ratio*[c]	*(4)* *Social capital index*	*(5)* *Fraction of children with single parents*
Correlation between 50/10 ratio and characteristic		0.17	–0.24	–0.44	0.64
50/10 ratio * mom is high school dropout	0.041	0.036	0.029	0.045	0.036
	(0.015)	(0.015)	(0.015)	(0.019)	(0.019)
50/10 ratio * mom is high school graduate	0.025	0.016	0.020	0.016	0.015
	(0.017)	(0.012)	(0.015)	(0.019)	(0.022)
State characteristic * mom is high school dropout	—	–0.001	–0.003	0.008	0.092
		(0.003)	(0.002)	(0.008)	(0.247)
State characteristic * mom is high school graduate	—	–0.005	0.004	–0.007	0.192
		(0.002)	(0.002)	(0.005)	(0.221)

Sources: Chetty and others (2014a); National Educational Longitudinal Survey; High School and Beyond; Educational Longitudinal Survey; National Longitudinal Survey of Youth, 1979 and 1997. Per-pupil expenditures and pupil/teacher ratios were obtained from historical data compiled by Elizabeth Cascio.

a. See the notes to table 1. Interacted state characteristics are listed in the column headings.

b. The per-pupil expenditure is measured in thousands of dollars.

c. Pupil/teacher ratios are divided by 10.

these are omitted variables driving the observed link between income inequality and dropout behavior. The regression results confirm that this is not the case. The data do not indicate a direct effect of these measures on the rate at which low-SES individuals drop out of high school. Nor does the inclusion of these measures alter the conclusion that greater lower-tail income inequality leads to higher rates of high school dropout behavior among low-SES individuals.

Table 6 also considers aggregate levels of social capital and family structure as potential mediating factors. Social capital is a measure introduced by Robert Putnam (2000) that combines voter turnout rates, the fraction of people who return their census forms, and measures of participation in community organizations.[24] Family structure is measured by the fraction of children living in single-parent households. Although social capital and the fraction of children living with single parents are more strongly correlated with our measure of income inequality, including these variables in the model similarly has little impact. Ultimately, the data fail to provide evidence that any of these potential factors is the mediating mechanism driving the empirical relationship we document.

V.D. Remaining Potential Confounding Factors

In the last set of horserace specifications, table 7 presents the results of including one additional set of interactions with other state-specific factors that could simply represent confounding factors. These include the percentage of the state's population that is minority, the state's poverty rate, the state's incarceration rate, and the fraction of employment in the manufacturing sector.[25] The goal here is to determine whether one of these state-specific factors is a contextual factor that is related to state-level income inequality and is driving the differential high school dropout rates. The results reported in table 7 do not indicate that this is the case. Interactions between each of these factors and SES are universally insignificant, and their inclusion in the regression model has no substantive impact

24. We obtained these data and the fraction of children with a single parent from the online appendix to Chetty and others (2014a).

25. Incarceration data are compiled by the U.S. Department of Justice, Office of Justice Programs, and were downloaded from http://www.ojp.usdoj.gov. Poverty rate data come from the U.S. Census Bureau's "Historical Poverty Tables" at http://www.census.gov/hhes/www/poverty/data/historical/people.html. Manufacturing data were obtained from the online appendix to Chetty and others (2014a).

Table 7. The Impact of Potentially Confounding State Characteristics on Boys' Likelihood of Dropping Out of High School, by Socioeconomic Status[a]

	(1) *50/10 ratio*	*(2)* *Percent minority*	*(3)* *Poverty rate*	*(4)* *Incarceration per 1,000 people*	*(5)* *Fraction of employment in manufacturing*
Correlation between 50/10 ratio and characteristic		0.41	0.63	0.44	–0.10
50/10 ratio * mom is high school dropout	0.041	0.053	0.056	0.043	0.043
	(0.017)	(0.018)	(0.026)	(0.021)	(0.015)
50/10 ratio * mom is high school graduate	0.024	0.021	0.021	0.008	0.024
	(0.012)	(0.017)	(0.021)	(0.014)	(0.017)
State characteristic * mom is high school dropout	—	–0.0007	–0.003	–0.047	0.221
		(0.0004)	(0.004)	(0.092)	(0.148)
State characteristic * mom is high school graduate	—	0.0001	0.001	0.066	0.012
		(0.0003)	(0.002)	(0.045)	(0.105)

Sources: U.S. Department of Justice; U.S. Census Bureau; Chetty and others (2014a); National Educational Longitudinal Survey; High School and Beyond; Educational Longitudinal Survey; National Longitudinal Survey of Youth, 1979 and 1997.

a. See the notes to table 1. Interacted state characteristics are listed in the column headings.

on the estimated effect of the interactions between lower-tail inequality and individual SES.[26]

V.E. The Role of Underlying Differences in Ability

As described above, a potential alternative explanation for the link between high inequality and low mobility is that in locations with greater demographic diversity, a mechanical correlation will link the two. The more similar the underlying populations, the lower the inequality (by definition) and the greater the mobility because chance will play a greater role in determining who succeeds in any given period. In essence, this is an argument about the underlying distribution of ability.

We explore this alternative within the context of educational outcomes, using test scores as a proxy for underlying ability. Specifically, we use data from scores on the Armed Forces Qualifying Test (AFQT), which was administered to participants in the NLSY79 and NLSY97 surveys. The AFQT is used by the military to determine eligibility and placement, and the score is reported as a standardized percentile ranking. These data have been used by empirical researchers in the past for similar purposes (Herrnstein and Murray 1994; Neal and Johnson 1996; Belley and Lochner 2007). We hasten to note that the AFQT is not a direct measure of innate ability; on this point, Elizabeth Cascio and Ethan Lewis (2006) show that exogenous increases in educational attainment lead to increases in AFQT scores, especially for minorities. It is most appropriately considered a cumulative measure of ability, reflecting innate endowments, environmental

26. We have also estimated many of the horserace specifications at the MSA level and confirmed that defining the geographic area at this level does not alter the qualitative results. Not all alternative characteristics considered in the main state-level regressions are available at the MSA level. Appendix table 1 reports results from including the interaction of SES with alternative measures of the income distribution. Appendix table 2 reports results from including the interaction of SES with segregation measures. Appendix table 3 reports results from including the interaction of SES with the fraction of children living with single parents and the fraction of employment in the manufacturing sector. The results correspond to the results from the state-level regressions: The estimated coefficient on the 50/10 interaction is not qualitatively changed from the addition of the new interaction. Furthermore, in all regressions but one, the estimated coefficient on the added interaction term is not statistically different from zero. The one exception is for the interaction of low SES with racial segregation measured at the MSA level. In this regression, MSA-level racial segregation appears to be positively related to dropout rates. Future work should pursue an investigation of mechanisms and look at different levels of geography. For the purposes of the present paper, the finding is upheld that there is an empirical relationship between lower-tail inequality and the likelihood that a low-SES boy drops out of school, and that does not appear to be driven by confounding factors at the aggregate level.

influences, and the result of formal and informal human capital investment. Still, these test scores provide information about cognitive ability at the time the examination was taken.

The purpose of the empirical analysis reported in table 8 is to determine whether these differences in the AFQT measure of cognitive ability can explain any share of the higher relative rate of dropout behavior among low-SES boys in high-inequality places. As in the tables above, the first column is included for the purpose of comparison; it reports the results from a model analogous to our main specification taken from table 1 for boys, with the estimated point estimate on the interaction of primary interest being 0.042 (with a standard error of 0.016).[27] Because the AFQT is only available in NLSY79 and NLSY97, the second column presents the same regression for just these two data sets. The results indicate a somewhat larger point estimate of 0.067 for the effect of inequality on dropping out, but the smaller sample size leads to greater imprecision as well (with a standard error of 0.029). The third column of this table examines what happens if we control for AFQT as an explanatory variable in a specification that is otherwise identical to that in column 2. We find that doing so does reduce the point estimate by about one-third, from 0.067 to 0.045. This is not statistically different from the estimated effect in column 1, but the standard error is now 0.028 (owing to the smaller sample size coming from having to restrict the analysis to just two data sets), and so this estimate is no longer statistically significant from zero.

In column 4, we treat AFQT as the dependent variable and estimate a model that is otherwise equivalent to those estimated above. The point estimates indicate that low-SES youth in high-inequality areas have lower AFQT scores; this relationship is marginally statistically significant (p value = 8.3 percent). This result helps explain why the estimated impact of inequality for low-SES boys fell when we added AFQT: It appears that low-SES boys who live in high-inequality locations have AFQT scores that are even lower than those for low-SES boys overall.[28]

27. The only minor difference between this specification and that in table 1 is that we omit all policy variables since we will subsequently be restricting the sample to just two data sets, leaving us with very limited variation across states over time. As the results indicate, dropping those variables has virtually no impact on the findings.

28. Multiplying the point estimate of –4.38 from the low-SES interaction term in column 4 with the point estimate of –0.005 on the AFQT variable from column 3 yields 0.022, suggesting that the lower AFQT scores of boys in high-inequality states would lead to a 0.022 percentage point relative increase in dropout rates, which is exactly the difference we see between columns 2 and 3. This is another way to see that differences in AFQT capture about one-third of the estimated effect of inequality on the dropout rates of low-SES boys.

Table 8. The Relationship between Socioeconomic Status, Inequality, and Armed Forces Qualifying Test Scores for Boys[a]

Sample	*(1) All five data sets[b]*	*(2) NLSY79 and NLSY97[c]*	*(3) NLSY79 and NLSY97*	*(4) NLSY79 and NLSY97*
Dependent variable	*High school dropout rate*	*High school dropout rate*	*High school dropout rate*	*Armed Forces Qualifying Test score[d]*
Mean	0.112	0.177	0.177	50.7
50/10 ratio * mom is high school dropout	0.042	0.067	0.045	−4.48
	(0.016)	(0.029)	(0.028)	(2.49)
50/10 ratio * mom is high school graduate	0.024	0.077	0.057	−4.10
	(0.018)	(0.025)	(0.023)	(2.27)
Armed Forces Qualifying Test	—	—	−0.005	—
			(0.0002)	

Sources: National Educational Longitudinal Survey; High School and Beyond; Educational Longitudinal Survey; National Longitudinal Survey of Youth, 1979 and 1997.

a. Standard errors, in parentheses, are clustered by state.

b. The five data sets used are listed in the sources line. The estimates in column 1 differ slightly from previous estimates because no state-level policy variables are included.

c. The sample used in column 2 is restricted to those observations with available Armed Forces Qualifying Test scores to compare to column 3. The sample size for columns 2 through 4 is 7,955.

d. Armed Forces Qualifying Test scores are reported as standardized percentile rankings.

There are two possible interpretations of these results. For readers inclined to interpret the AFQT as measuring innate ability, one could conclude that the exclusion of the AFQT variable in previous analyses leads to an upwardly biased estimate of the relationship between income inequality and dropout rates; still, two-thirds of the effect remains. An alternative interpretation is that part of the effect of income inequality is captured by decreased educational investment before the actual dropout event. This corresponds to a leading view of dropout behavior as a process rather than a discrete event: A student begins to demonstrate irregular attendance, then multiple failed courses, and eventually the obstacles to graduation feel overwhelming and the student drops out (Rumberger 2011). In other words, discouraged students stop applying themselves early. This could show up as a lower AFQT score, consistent with the finding of Cascio and Lewis (2006) that an exogenous increase in education leads to higher AFQT scores. Their finding would imply that decreased effort in school, and in learning more broadly, would result in a lower AFQT score. Regardless of interpretation, the impact of greater inequality on dropout behavior is substantial, albeit somewhat smaller if one accepts the interpretation that the AFQT measures innate ability.

VI. Self-Reported Reasons for Dropping Out of School

In an attempt to explore students' own stated reasons for why they dropped out of school—and to see if they are consistent with our proposed model—we take advantage of data from the High School and Beyond survey. In 1980, high school sophomores were initially surveyed, and then they were resurveyed in 1982. We focus on those in the 1982 survey who left school after their sophomore-year interview in 1980. The sample for this "dropout survey" includes 2,421 individuals, or roughly 8 percent of the initial 1980 cohort. These individuals were asked why they dropped out and were given a set of 16 possible reasons; they were allowed to mark as many as applied. Though we acknowledge that students' self-reported reasons for dropping out of school might not accurately reflect their underlying motivations, there is potentially something to be learned from whether the stated reasons were academic in nature.

A focus on perceptions, as discussed above, implies that the high school dropout decision is less likely to be driven by academic difficulties. In other words, if a student perceives a lower benefit to remaining in school, then he or she will choose to drop out at a lower threshold of academic difficulty. We look to the data to see if there is any support for such a

notion. The most direct measure of academic difficulty is the response "had poor grades / not doing well." Other reasons that might reasonably be considered academic include expelled or suspended; did not get into desired program; school grounds too dangerous; and moved too far from school. The remaining 11 options include stated reasons that are less directly academic: had to support family; offered job and chose to work; school wasn't for me / didn't like it; wanted to travel; wanted to enter military; friends were dropping out; married or marriage plans; pregnant; illness/disability; couldn't get along with teachers; and couldn't get along with students. Looking at the share of students who report each particular reason, and how these compare across states by inequality level, we see that 51 percent of dropouts in the least-unequal states reported that they dropped out because of poor academic performance, as compared with only 21 percent of students who dropped out in the most-unequal states. This is the only particular reason (of the 16) that shows a difference in shares across states by inequality level that is statistically significant.

Regression-adjusted results are similar. Controlling for the same set of individual- and state-level controls as described in equation 6 above, and controlling for a state fixed effect, the data indicate that low-SES students in the highest and middle-range inequality states are 25 to 29 percentage points *less* likely to cite poor grades as a reason for dropping out. This represents a nearly 50 percent reduction in citing poor grades. This reason has by far the largest difference between low-SES students in high- and low-inequality states. Although not conclusive, these survey data are broadly consistent with the notion that low-SES boys in more unequal states are more likely to drop out, not because they are struggling academically but potentially because they perceive a lower return from staying in school. In other words, for the same level of academic performance, low-SES students in more unequal places are more likely to drop out of school.

VII. Discussion

In this paper, we have proposed a mechanism whereby greater levels of income inequality might lead to lower rates of upward mobility, namely, lower levels of high school completion among individuals from low-income backgrounds. We empirically test the proposition, and also test for the role of confounding factors and potential mechanisms. Our analysis offers compelling evidence that low-SES youth, boys in particular, are more likely to drop out of high school if they live in a place where the gap between the bottom and middle of the income distribution is wider.

The fact that boys appear to respond to greater levels of income inequality by dropping out of school more often is consistent with a growing body of evidence suggesting that boys suffer greater educational and labor market consequences from family and economic disadvantage (Bertrand and Pan 2013; Autor and others 2015; Chetty and others 2016). However, these patterns do not necessarily mean that low-SES girls are not affected by the economic disadvantage or conditions around them. They might simply respond on different margins. For instance, in Kearney and Levine (2014) we use empirical methods analogous to those we have used in this paper and find that low-SES girls in more unequal places are significantly more likely to become young, unmarried mothers.[29]

We interpret the findings as being consistent with—albeit not a conclusive demonstration of—a model of decisionmaking where a persistently wide gap between the bottom and middle of the income distribution has a negative effect on the perceived likelihood of economic success through human capital investments. This could occur either through impeded opportunity in actuality or through an effect on perceptions, shaped by a variety of factors experienced throughout one's childhood. The finding that higher levels of lower-tail income inequality lead to greater rates of dropout is robust to including the high school graduate wage premium in the regression model. In fact, the data indicate that the wage premium itself reduces the dropout rate, but household income inequality has an offsetting positive effect. In an additional set of models that examine potential mediating factors—including residential segregation and school financing—the data reject the hypotheses that any of the identified contextual factors are responsible for the relationship. Because the data do not offer support for any of these direct mechanisms, we are left with a residual explanation about perceptions. Future work is needed, ideally drawing on the insights from multiple disciplines—including, for example, social psychology—to attempt to more directly investigate this line of explanation.

There are important policy implications of this work regarding the types of programs needed to improve the economic trajectory of children

29. One might think that a higher level of early, nonmarital childbearing would lead to increased dropout rates among girls. However, existing evidence suggests that higher high school dropout rates among teen mothers is more likely to reflect selection issues than a causal effect of teen motherhood. Given our reading of that evidence and literature, which we summarize in Kearney and Levine (2012), we do not view it as inconsistent or surprising that in our earlier paper we found that low-SES girls in more unequal states are more likely to become young mothers, but in this paper we do not find that they are more likely to drop out of school.

from low-SES backgrounds. Successful interventions would focus on ways for low-SES youth to increase the likelihood of achieving economic success. These interventions could focus on improving the actual rate of return on investing in human capital for them, as we often discuss. But they also could focus on improving perceptions. College scholarship programs for low-SES high school graduates, for instance, may make college a better investment for low-income youth and increase the return associated with graduation from high school. But they could also alter the student's perception that going to college is the sort of activity that he or she can achieve. Other such interventions might take the form of mentoring programs that connect youth with successful adult mentors, or school and community programs that focus on establishing high expectations and providing pathways to graduation. They could also take the form of early childhood parenting programs that work with parents to create more nurturing home environments to build self-esteem and engender positive behaviors.

One might view the results described above regarding AFQT scores as suggesting that earlier interventions in a child's life are preferable because they can alter children's academic circumstances well before the point where they are deciding whether or not to stay in school. This evidence, along with evidence from other research, supports the notion that early intervention can have large payoffs. Nonetheless, it is worth noting that there is great social value in identifying interventions that can help improve the trajectory of economically disadvantaged children growing up in high-inequality areas who have already fallen behind.

We believe these implications are consistent with the new set of results coming out of the Moving to Opportunity for Fair Housing (MTO) experiment. MTO was a randomized controlled trial that offered housing vouchers and mobility counseling to inner-city, low-income families living in public housing. The results from the first generation of MTO movers provided little evidence that moving to a low-poverty neighborhood led to noticeable improvements in adult economic outcomes or teenagers' educational attainment (Kling, Liebman, and Katz 2007). However, more recent evidence from Chetty, Nathaniel Hendren, and Katz (2016) that children who moved when they were very young had higher college attendance rates and ultimately received higher wages. The authors' interpretation of these findings is that the greater resources in the low-poverty area had more time to take effect on the younger children. Although we do not dispute this interpretation, our model would additionally suggest that an important reason why the program was successful for younger children is because it

changed their perceptions of what would be possible for them. Those children who moved at younger ages not only had the advantage of greater resources for a longer period of time, but they also spent less time with a highly disadvantaged peer group, which might have altered their perceptions of what was possible for them.

This interpretation also builds nicely on the contributions of Flavio Cunha and others (2006), and Cunha and James Heckman (2007), among others, arguing that "skills beget skills." The theory is that investments in skill at an early age compound and have a larger eventual effect on economic well-being than investments in skill at an older age. Our conceptualization might be complementary to this view, insofar as "perceptions beget perceptions." This is not to say that interventions later in life do not have the ability to improve one's perceptions, but it may be more difficult to overcome this hurdle.

Our analysis has demonstrated that a greater, persistent gap between the bottom of the income distribution and the middle leads to lower rates of high school completion among economically disadvantaged youth, boys in particular. These findings have implications for the potential of disadvantaged youth to achieve upward mobility and for the types of policies that are likely to be successful. Furthermore, they reflect a plausible channel through which higher rates of income inequality might causally lead to lower rates of social mobility. To improve rates of upward mobility, economically disadvantaged youth need reasons to believe that they can achieve economic success.

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Comments and Discussion

COMMENT BY

MILES CORAK Like all nicely crafted papers, this one by Melissa Kearney and Phillip Levine helps answer some important questions, while at the same time raising other equally important and interesting questions. My comments revolve around the answers they offer to three questions that help inform public policy directed to social mobility: (i) Inequality of what? (ii) Social mobility for whom? and (iii) Whither the dropout rate?

INEQUALITY OF WHAT? The authors focus our attention on the degree of inequality in the lower half of the income distribution. This is an important lesson for researchers examining intergenerational mobility. The theoretical starting points in this literature are the seminal papers by Gary Becker and Nigel Tomes (1979, 1986), and by Gary Solon (2004, 2015), who refines the Becker–Tomes theoretical framework for the study of differences in mobility over time and across space. In particular, Solon (2004) alerts us to the importance of the return to human capital as a determinant of the degree of relative intergenerational mobility, with a higher return offering more incentive for parents to invest in the human capital of their children. This leaves open the issue of which families have the greatest opportunity to make these investments, the presumption being the most educated will ramp up to a much greater degree, giving their children a longer stride in the march up the income ladder. This is what drives an inverse causal relationship between inequality and intergenerational mobility. But this is a presumption, and Kearney and Levine helpfully point out that we may need to pay attention to the heterogeneity of returns across socioeconomic groups. Higher returns to schooling will be a force leading all children to get more schooling, and though there may be all sorts of reasons why the rich will move forward with more zeal, it is important to appreciate that the incentives will be dulled for the less advantaged if greater inequality

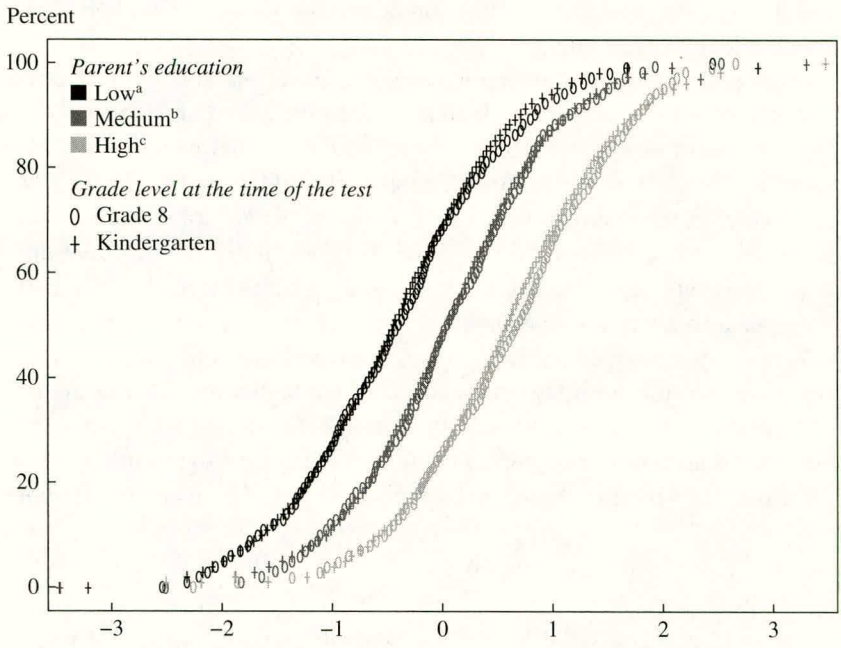
induces, in their words, "relative disenchantment." Inequality of what? It is inequality in the lower half of the income distribution that bites, and matters for this causal channel.

This opens up a public policy concern about behavior, and by implication policy should be directed to the perceptions, information, and actions of youth raised by low-status families in high-inequality areas. But another dimension of this paper also needs to be noted. Kearney and Levine base their analysis on a particular definition of income: total income, which includes all market sources of income, and also all income from government transfers. Inequality of what? The returns to education should be assessed in terms of not just market incomes but also total income returns. If income transfers are in play, then this would seem to raise other policy concerns, particularly if we buy their story that inequality is causal. If this is the case, then the implication would be that policymakers should also direct their attention to shrinking the gap between middle and bottom incomes. The paper seems to leave us with questions about whether to directly raise the prospective incomes of high school graduates. But if income transfers influence the type of inequality that matters, why not address inequality directly and let the behavior take care of itself?

SOCIAL MOBILITY FOR WHOM? This question of whether to address inequality directly is particularly relevant, given the answer the paper offers to a second question: Social mobility for whom? The findings focus our attention on the influence of relative incomes on upward mobility from the bottom in an absolute indicator: Lower-tail inequality has a negative impact on the prospect of graduating from high school. But this is true only for boys; there are no substantive results for girls. With respect to public policy, it makes one wonder about the logic of a narrow and focused design for income support policies like the Earned Income Tax Credit, and in particular about the rationale for excluding the male population from one of the most important innovations in the delivery of income support.

But Kearney and Levine's answers to "Social mobility for whom?" cut even deeper. In the series of "horserace" regressions they use to assess the robustness of their main findings, the only thing that seems to bite is a measure of ability, as described in their table 8 and the associated discussion. Imperfect as the Armed Forces Qualifying Test (AFQT) is as a measure of ability, the authors' analysis does raise, as they correctly mention, a link between their findings and the well-developed literature on the importance of investments during the early years—the view that child development moves recursively through a series of interrelated stages. Social mobility

Figure 1. Percentage of Children At or Below a Particular Level of Standardized Mathematics Test Scores



Source: Bradbury and others (2015), figure 2.5.

a. Refers to families in which the parent with the highest level of schooling had no more than a high school diploma.

b. Refers to families in which the parent with the highest level of schooling had at least a high school diploma, but no college degree.

c. Refers to families in which the parent with the highest level of schooling had at least a college degree.

for whom? For boys, but most likely for boys who seem to have reached the first years of high school with lower AFQT scores. It is interesting to note that Bruce Bradbury and others (2015), among others, have found that there are certainly significant gaps in mathematics and reading test scores between children from different socioeconomic groups at the age when they are about to begin high school (my figure 1 is adapted from their figure 2.5). But they also find that the distributions in test scores when these same children were of kindergarten age are almost exactly the same. We pretty well know the distribution of test scores in mathematics and reading at age 14 from the distribution of test scores at age 4 and 5. So if you continue to believe that policy should be directed to behavior, then you also

need to ask yourself whether it should be focused on children during the high school years, or on the early years. It is beyond the scope of this paper to offer an answer to this question, but it needs to be addressed before any specific lessons are drawn.

This paper does not have an explicit identification strategy to uncover causal effects. The authors are well aware of this reality, and their analysis is geared toward assessing how robust the conditional expectations they uncover are to a host of additional factors that could also plausibly be playing a role. In the standard way, one can never "prove" a hypothesis, only hope to disprove it. That they have succeeded in failing to disprove their hypothesis will certainly leave some readers unconvinced. But the ideas they put forward merit consideration as the literature on the determinants of schooling moves ahead. Kearney and Levine's thesis might prove fruitful in considering a third question: Whither the high school dropout rate?

WHITHER THE HIGH SCHOOL DROPOUT RATE? There has been much discussion about whether or not trends in inequality and social mobility are informative. Why do we not see falling social mobility in an era of higher inequality? The answer given in the opening pages of Kearney and Levine's paper is that we are focusing on the wrong type of inequality. Inequality has been on the rise because of higher top income shares, but the mobility process is driven by middle-level inequality, according to Raj Chetty and others (2014), or by lower-tail inequality, according to Kearney and Levine. Measured in these ways, inequality has not risen, and we should not be surprised by the fact that social mobility has been flat. Fair enough. But there are also reasons to think that trends in inequality and intergenerational mobility are not informative because of the long lags involved in the processes linking the two, and because the adjustment dynamics may well be nonmonotonic, as described by Martin Nybom and Jan Stuhler (2013).

But all this makes more sense when the focus is on intergenerational income mobility, a comparison of the adult incomes of children with the incomes of their parents. For many important outcomes in the process of child development, such as high school graduation, we do not need to wait as long to get accurate measurements of the degree of mobility. Richard Murnane (2013) offers a careful survey of what we know about the high school dropout rate, and he describes an important puzzle: High school graduation rates have been on the rise since about 2000, yet there has been essentially no trend in the wage rate of dropouts relative to graduates. Now it may be that the more important wage is that relative to college graduates, or it may be that something else is going on. Could it be that in some way parents and youth are getting the message that schooling

matters, and it matters more now than for past generations? As research in this area continues, it will certainly be important to examine whether and in what way the disenchantment hypothesis, and possible changes in disenchantment, that Kearney and Levine eloquently put forward is part of the answer to this puzzle.

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COMMENT BY

ROBERT A. MOFFITT This interesting paper by Melissa Kearney and Phillip Levine is another contribution to the literature on the pernicious effects of growing income inequality. However, unlike most of the studies of this issue to date, Kearney and Levine make a serious attempt to estimate the causal spillover effects of income changes in one part of the distribution on the behavior of groups in a different part of the distribution. In their specific case, they are interested in what happens to the educational attainment of children who come from disadvantaged families if the 50th percentile of income—an income level far above their own—rises,

holding constant their own income.[1] At least for boys, they find that such a rise increases the rate of their high school dropout (relative to that of higher-income families), which, if correct, would be a disturbing result.

Kearney and Levine rightly point out that most of the literature on this question does not attempt to make causal statements about the effects of inequality on individual outcomes. Their discussion of the literature largely focuses on examinations of the correlation between intergenerational income rank mobility and the level of income inequality across time or across areas, which is not quite what they are examining, because the educational attainment of low-income groups (their outcome variable) is not the same as rank mobility, even of educational attainment. Rank mobility is measured as the relative intergenerational income—or education—mobility of children coming from different income or educational strata. The object of interest in the rank mobility literature is the probability that children from low-income families, for example, have a chance of improving their incomes sufficiently to actually pass up children growing up in middle-income families. Kearney and Levine do not examine this directly; they only look at the relative probabilities of dropping out of high school for children from low-income versus higher-income families, and whether a change in these relative probabilities could generate a change in the later adult earnings gap between such children without a change in rank. My own view is that Kearney and Levine's outcome is more important than rank mobility, but I also think that much of the motivating discussion in their paper, which examines rank mobility, is not directly germane to their analysis.

An implication of their result, to which they refer only briefly, is that a natural extrapolation of their findings would suggest that a rise in the 50th percentile level of income, which lowers the educational attainment of those in the lower quantiles, should increase inequality even further by lowering incomes at the bottom. This would raise the ratio of the 50th percentile level of income relative to the bottom even further, and would hence raise inequality even more, which could lead to further

1. Kearney and Levine do not hold family income fixed, but rather the family's education level, race, and family structure. In addition, in most of their analyses they only examine the effects of changes in the 50/10 ratio, not the effects of changes in the 50th percentile, holding constant the 10th percentile. However, their table 3 shows that the same result is obtained for a specification that estimates the effect of the 50/10 ratio, holding constant the 10th percentile. This implies that the way I have stated their central finding is consistent with their results, especially if the 10th percentile is interpreted as a proxy for the income of disadvantaged families, which I believe is one possible interpretation.

reductions in educational attainment at the bottom. This would constitute a negative feedback loop.

In any case, Kearney and Levine do not attempt to address causality with the conventional methods of correcting for endogeneity with instrumental variables or by a search for natural experiments where an arguably exogenous shock to inequality is used to obtain a superior estimate of its effect on individual family outcomes. Instead, theirs is an examination of whether the cross-sectional correlation between inequality and those outcomes is reduced when one controls, in a regression setting, for a variety of influences that might reasonably be thought to be generating the raw, unconditional correlation. In the language of the causal effects literature, this is the method of "selection on observables," to be contrasted with "selection on unobservables." That they do not attempt to examine the latter is probably the chief concern that many will have about their analysis. In the end, after controlling for many observables that they can measure with their data, they are left with a significantly positive correlation between the level of inequality and the low educational attainment of low-income boys. As they readily admit themselves, what they have done is to identify a "residual" correlation whose source is still not known but that they are willing to interpret as reflecting a true causal effect.

Kearney and Levine make an argument that, alternatively, using a cross-area, differences-in-differences strategy by examining the relationship between changes in inequality and changes in educational attainment across different areas is unlikely to work because short-term changes in inequality are likely to be transitory and are therefore not likely to have much of an effect on something like educational decisions. I find this convincing for changes at the annual frequency, but I am not clear on why longer-run differential changes in inequality across areas could not be used for such an exercise. Inequality has no doubt grown at different rates in different areas over the longer run, not least because of differences in their industrial structures, and the correlation of these rates with changes in educational attainment over a similar time frame would more likely pick up the effect of quasi-permanent changes in inequality on outcomes, not transitory ones.

Nevertheless, Kearney and Levine's main finding is that there is still a residual, positive, cross-sectional correlation between income inequality in a state and the likelihood that a boy from a disadvantaged family will fail to complete high school, even after controlling for a number of observable differences in both family and state characteristics. They suggest that this residual correlation is a result of "despair," meaning that a child at the bottom of the income distribution "does not see much value

in investing in his or her human capital." Kearney and Levine's simple economic model posits that an increase in inequality (for example, an increase in the level of the 50th percentile of income) changes the child's perception of the utility value of investing in education. I think it would be helpful to parse this presumed effect into two different effects. One is that an increase in inequality changes the child's perception of the monetary return to investing in education, while the second is that it changes the utility value of attaining a higher level of education and income, even if there is no change in the monetary return. I can more easily imagine the term "despair" being associated with the latter mechanism than with the former. Though the latter mechanism could be interpreted, for example, by supposing that if a low-income child thinks he is increasingly unlikely to catch up, much less pass up (in the sense of rank mobility) a middle-class child in future income, the child might attach less utility value to attempting to increase his or her income through education. But for the former mechanism to work, if I am a low-income child and I see that middle-class children are making more money than they used to if they graduate from high school, somehow this leads me to think that I will make *less* money by graduating from high school than I did before, and I curtail my educational investments accordingly.[2]

The difference is important because the former explanation is related to the idea of incomplete or inaccurate information, which has been the subject of discussion in the literature for many years. The classic hypothesis by William Julius Wilson (1987), discussed in Kearney and Levine's paper, is really about the perceptions of the monetary rate of return, arguing that the departure of middle-class families from neighborhoods where low-income families live means that disadvantaged families no longer see success stories around them, leading them to conclude that success is unlikely. (Kearney and Levine test for this by controlling for income segregation and find it not to matter, but they admit that their state-level segregation variable may not capture what is a much more geographically local phenomenon.) In addition, recent work by Caroline Hoxby and Sarah Turner (2013) has discovered that many high-achieving high school students from low-income families do not apply to good colleges that they could surely get into. Further, they find that if they provide information on college grad-

2. The Luttmer (2005) paper cited by Kearney and Levine shows that lower-income families are unhappier when they live close to higher-income families, but this does not directly relate to perceptions of rates of return.

uation rates, instructional resources, and application procedures to such students, coupled with waivers of college application fees, they are led to apply to better colleges. This supports an information story. At much earlier ages than Kearney and Levine are studying, Flávio Cunha, Irma Elo, and Jennifer Culhane (2013) have studied whether the failure of low-income parents to invest in their preschool children's human capital by reading books and devoting time and resources to their children is because they do not perceive the return to those investments to be high. All these information stories lead directly to policy interventions that improve information, and Kearney and Levine discuss some somewhat related possible interventions in their final section.[3] But for these stories to provide an explanation for Kearney and Levine's findings, it has to be the case that information is reduced when median income rises, which is more difficult to imagine.

The mechanism behind the perceptions effect hypothesized by Kearney and Levine also could bear more thought. The mechanism is an extremely local one, suggesting that children in low-income families perceive changes in the income of middle-class families in their geographic areas. But in my home city of Baltimore, children from the sprawling, low-income West Baltimore part of the city almost never venture outside their neighborhoods, and even a trip downtown is a major one, usually fraught with uncertainty and tension. These children have no doubt always perceived that the city's middle-class neighborhoods are different from theirs, but I am not sure how they are able to figure out that the gap between them and the middle-class children has grown. The mechanism needs to be local, because perceptions of inequality garnered through television or through social media are more likely to be national in scope and would not be based on local increases in income inequality.

The failure of low-income children to improve their educational outcomes in light of increasing monetary returns to education has been identified as a long-standing puzzle in the literature. Claudia Goldin and Lawrence Katz (2008, figure 1.5 and table 2.7) show that completed years of education for boys stopped rising for children born around 1950, who came of age just when rates of return to education started to strongly rise, and that this has occurred in the face of rising economic returns to high

3. Probably the most recent ambitious attempt to gather data on children's and parents' perceptions of the rate of return to education is that of Manski (2004), who has devised survey questions intended to elicit the full distribution of perceived potential earnings outcomes under different levels of education.

school completion. James Heckman and Paul LaFontaine (2010) and Richard Murnane (2013) show specifically that high school graduation rates drifted downward between 1970 and 2000. Goldin and Katz (2008, pp. 347–50) suggest that this has occurred because primary and secondary schools are failing to provide students with the skills necessary for college, because high school dropouts are especially unprepared, and because financial access to higher education has declined given rising tuitions and other college costs.[4] Alan Krueger (2003) likewise believes that credit constraints have hindered educational attainment and that school quality measures, such as class size, have an important impact, while Pedro Carneiro and Heckman (2003) identify deficiencies in preschool investment in both cognitive and noncognitive traits as well as a lack of school choice and school incentives as the primary problems. Murnane (2013) suggests that the decline in the high school graduation rate has been caused by poor skills preparation for students entering high school, coupled with rising high school graduation requirements, and with the rise of the GED, which provides weak training, as an alternative.

But what is missing when this literature is considered is why these barriers to investment in education would be correlated with the level of median income in a state, especially if the culprit is not a lower rate of return to high school completion in high-inequality states, as Kearney and Levine find.[5] They test for differences in school quality using per-student expenditures and pupil/teacher ratios and find that this does not change the result, although these quality measures are admittedly rough. For any of the other above-noted explanations to work, one would need to find that college tuition, credit constraints, GED credentials, or preschool investments differ across states with different levels of income inequality.

In the end, I find Kearney and Levine's paper to be more important for its negative results than for its positive ones. Showing that controlling for a list of the usual suspects as to why so many low-income children fail to complete high school does not significantly reduce the correlation between local income inequality and high school dropout rates is a discouraging but useful finding. The remaining task is to further explore the residual and its sources, and I look forward to reading more research by Kearney and Levine and others on this important topic for public policy.

4. College costs could affect high school dropout rates if teenagers see high school completion as a stepping-stone to college.

5. Kearney and Levine show that the actual monetary return to high school completion is lower in high-inequality states than in low-inequality states, but it is lower for children from families at all income levels, not just low-income children.

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GENERAL DISCUSSION Benjamin Friedman noted that while it is true that especially today much of the discussion of inequality and mobility does focus on *rank* mobility, there is certainly a long tradition of focusing on the relationship between inequality and *level* mobility. There is some discussion along these lines in the economics literature, he noted, but there is even more in the political science literature. One should not think that the relevant trade-off is only inequality versus a relationship to rank mobility; level mobility matters too.

Friedman also suggested that rising college tuitions might well be a relevant factor in a student's decision to drop out of high school. He argued that it is not true that the only rationale for graduating from high school, rather than dropping out, is that the graduate then, with probability equal to 1, takes the kind of job that is available to high school graduates. Graduating from high school in effect presents a fork in the decision tree, with some

probability of going directly to work but also some probability of going on to college, and all that then follows. Of course, if one does not graduate from high school, those probabilities are, for all practical purposes, also equal to 0. The rise in college tuitions, at state institutions in particular, he believed, might therefore be relevant to the discussion.

Michael Klein spoke next, suggesting that a high school in an inner city might not be the same as a high school in a suburb. The returns to a high school education might mean something very different, depending on the location. In places with higher inequality, there could be a perception that the school is worse or the school could in fact be worse, and the cost of dropping out might be perceived to be much lower. The concept of a "high school dropout," he explained, might really be a heterogeneous thing in terms of expected income if the student attended a really good or really bad high school.

Janice Eberly was interested in the authors' findings on gender differences, specifically the finding that there is no effect of low socioeconomic status and inequality on girls, but a significant effect on boys. She was also interested in this finding's relationship to a finding from another paper by the authors: that girls of low socioeconomic status in more unequal places are significantly more likely to become young, unmarried mothers.[1] These two results seemed puzzling when put together because the authors were essentially finding that girls of lower socioeconomic status tend to have higher rates of teen pregnancy but that they nonetheless tend to stay in school. Eberly wondered if the explanation for this finding was that the gender effect on education was just so strong that it swamped the potential pregnancy effect, or if policy interventions for teenage mothers in schools were truly effective at keeping them in school, and whether there was something to learn from that fact.

Scott Winship had two comments. First was a general comment about the Great Gatsby Curve, which plots the positive relationship observed between inequality and intergenerational social immobility. He noted that some measurement issues actually weaken the significance of the curve, and highlighted some other research that fails to show a relationship between rank mobility and inequality. Second, Winship wondered why the authors had omitted a finding from an earlier version of their paper, which indicated that when a state's level of intergenerational mobility was entered into the model, it was so collinear with cross-sectional inequality that the

1. Melissa S. Kearney and Phillip B. Levine, "Income Inequality and Early Nonmarital Childbearing," *Journal of Human Resources* 49, no. 1 (2014): 1–31.

authors could not distinguish separately between the effect of inequality and that of mobility. There was no mention of this result in the conference draft, which gave Winship the impression that no covariates the authors examined reduced the effect of inequality.

Valerie Ramey and discussant Miles Corak were of the opinion that most of what affects students' discount rates for the future happens before age 5, so if one were to look at policy prescriptions, they should ideally be targeted to that age group. Ramey pointed to evidence suggesting that these discount rates are probably not inborn, and can be affected by many characteristics of a child's environment, such as whether the parents use cigarettes or other drugs. This would support the notion that targeting policies to children under the age of 5 may help them to favorably revise their future discount rates at an early age, which down the road could make them less likely to drop out of high school.

Martin Baily suggested that it might be beneficial to implement interventions aimed at informing students about what it is like to be a high school dropout versus not being one. If students are simply given information about the options available to them, or what it is like to be in a dropout job versus a graduate job, they might be affected. He cited a paper in which the authors find that simply giving young women information about what it was like to be pregnant and unmarried made them less likely to end up in that situation.[2] Perhaps similar interventions could be applied to students considering dropping out of high school.

Robert Gordon noted that it matters a lot for the 50/10 ratio—the ratio of the 50th and 10th percentiles of the earnings distribution—whether inequality is due to the 50th percentile being too high or the 10th percentile being too low. If the cause is that the 10th percentile is too low, then there may just be a population of single mother–headed households living in poverty in which the mothers happen to drop out of high school; in this case, nothing can be concluded about inequality, as what has been found is simply that these types of families have a higher propensity to drop out of high school.

Gordon also observed that there had not been much discussion about race, which could potentially be important, given that boys and girls were found to have experienced different outcomes. Given that there is a sizable fraction of African American teenage boys in prison who cannot complete

2. Melissa S. Kearney and Phillip B. Levine, "Media Influences on Social Outcomes: The Impact of MTV's *16 and Pregnant* on Teen Childbearing," *American Economic Review* 105, no. 12 (2015): 3597–632.

high school, he wondered what would happen to the inequality and high school dropout data if African Americans were removed from the sample.

Brad Hershbein wondered if the authors could push the data on high school characteristics a little bit further, particularly for rural versus urban schools. The exercise could perhaps shed some light on the issue of whether there is an information problem or a perception problem, points raised earlier by Baily and Klein, respectively. Either the students know that they don't know (perception problem), or don't know that they don't know (information problem), what Hershbein called a "Rumsfeldian uncertainty," a nod to former U.S. secretary of defense Donald Rumsfeld, who stated, "There are known knowns . . . there are known unknowns" during a U.S. Department of Defense news briefing on February 12, 2002.

Abigail Wozniak agreed with Friedman that looking at college tuition costs might be an important component of a student's decision to drop out of high school. Related to Gordon's point about incarceration and crime, Wozniak encouraged the authors to look at some of the work that had been done on the crack epidemic and how it changed expected returns for young men during that period, and subsequently how it has since reversed itself, potentially playing a role in the rising high school completion rates seen in recent years. She cautioned that the authors might be putting too much weight on the explanatory power of their horserace-style regression models, and referred them to the research of Emily Oster, who has done some nice work on the subject.

Justin Wolfers complimented Corak for his handling of the Great Gatsby Curve, which Wolfers admitted he long thought was one of the most interesting stylized facts in all of social science. He believed the paper's framing around whether the Great Gatsby Curve is a causal relationship was an ill-posed question. He explained that rising inequality caused by a rise in the price of inheritable skill would cause the highly skilled to be rich, therefore causing their kids to be well off. On the other hand, rising inequality due to a rise in the price of noninheritable skill would not, meaning that there are just different forms of variation. It might also be the case that "kid quality" is a normal good, meaning that it increases with income, creating a direct link from parents' wealth to child's success.

Wolfers also thought that it was important to be clear about whose behavior the authors were describing. In the despair-based model, the authors are describing the student's decision not to go on to college. Resource constraints, on the other hand, might mean that it is the parents' decision whether the student does not go on to college. Wolfers was also worried

that a large proportion of young men whose mothers dropped out of high school might be incarcerated, and therefore not in the data set.

Finally, on the policy implications, Wolfers suggested that, in resource-poor environments, human capital education might not actually be the right investment for some students to make. The authors' policy conclusions seemed to follow only if the rate of return to investing in high school was high for all students.

Melissa Kearney began by addressing some of the policy implications. In his presentation, Corak had suggested focusing on lowering the 50/10 ratio by bringing up the 10th percentile. Kearney fully agreed. There are many reason why improving the material well-being of people at the bottom is important. But somewhat to their surprise, the authors also found that, while being poor is bad, the gap between the poor and the well-off is also bad.

Responding to comments about how early to invest in students, the authors agreed that it was important to invest in kids at an early age. They believed this to be very consistent with their results from the recent Moving to Opportunity for Fair Housing program, which suggested that it was in fact the kids who moved early who got the benefits, and if they moved when they were teens, they essentially missed out on the benefit. However, Kearney believed that it was still important not to give up on struggling teens, and felt uncomfortable with the policy discussion thus far that seemed to be suggesting that the only thing that matters is early childhood education; it cannot be that we just have to give up on kids who are 10 years old and in a bad position, she explained. She was encouraged by some new results coming out of the Chicago Urban Lab's evaluation of the Match Education program, which have shown that intensive tutoring programs with a mentoring component are really improving the graduation rates of some of the most academically disadvantaged kids. Similarly, evaluations of the Pathways to Education program in Toronto have shown that investing resources in high school kids from very disadvantaged areas does tend to increase their high school graduation rates.[3] So yes, Kearney agreed that investing in students early on is great, but argued there are also things that can be done to help teenagers finish high school.

3. See for example, Philip Oreopoulos, Robert S. Brown, and Adam M. Lavecchia, "Pathways to Education: An Integrated Approach to Helping At-Risk High School Students," Working Paper no. 20430 (Cambridge, Mass.: National Bureau of Economic Research, 2014).

Kearney made it clear that the authors did not use *rank* mobility, and that they were not interested in "churning for the sake of churning." Conversations among the general public sometimes focus on social mobility from the perspective of rank mobility, and the authors were more interested in kids at the bottom having potential to move up in the income distribution. Part of what the authors wanted to accomplish with their paper was to pivot to focusing on not just upper-level income inequality but also on lower-level income inequality, and not just churning social mobility for the sake of churning, but upward mobility for poor kids.

Some questions were raised about the authors' use of cross-sectional variation. Kearney noted that there is no shortage of papers finding that places with high levels of income inequality have bad outcomes. She argued that the authors were moving beyond that by using individual-level data, by comparing kids from disadvantaged homes in more and less unequal places. It is true, however, that the authors had not randomly assigned income inequality, and they did not have a great instrument for long-term inequality in some places. What they wanted to confirm was that income inequality was having a negative effect on kids at the bottom. They work really hard in the paper to say that it is actually the gap in the distribution that matters, and not something else going on in the state. The authors had run many regressions to show that, empirically, there is something about the 50/10 ratio that is related to the dropout rate of disadvantaged kids, and that it is a more important predictor than, say, the incarceration rate or the share of manufacturing workers.

Kearney noted that where this research needed to go next was to figure out how its findings show up "on the ground." Do the neighborhoods where these kids live have worse schools? Do they have thinner job networks? The authors would like to look at tax data to get at more local geography, and to have ethnographers and social psychologists interview the kids with the authors' hypotheses in mind. The authors felt equipped to handle some of the questions raised in the room, while they felt other questions needed to be addressed by other social scientists. Phillip Levine added that there appears to be interesting empirical regularity that seems like it is suggesting something consistent with the model the authors were describing, but noted that they certainly would need to go a lot further before actually drawing specific conclusions about the mechanisms.

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