Are Connections the Way to Get Ahead?

Social Capital, Student Achievement, Friendships, and Social Mobility

Paul E. Peterson (ppeterso@gov.harvard.edu)*

Program on Education Policy and Governance, Department of Government

Harvard University, USA

https://orcid.org/0000-0001-8073-5186

Angela K. Dills (akdills@email.wcu.edu)

School of Economics, Management, and Project Management, Western Carolina University, USA

https://orcid.org/0000-0001-9527-9902

&

M. Danish Shakeel (danish.shakeel@buckingham.ac.uk)

E. G. West Centre for Education Policy, The University of Buckingham, UK

https://orcid.org/0000-0002-7700-8540

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Author Bios

Paul E. Peterson is the Henry Lee Shattuck Professor of Government and Director of the Program on Education Policy and Governance at Harvard University, and a Senior Fellow at the Hoover Institution at Stanford University.

Angela K. Dills is Professor of Economics and the Gimelstob-Landry Distinguished Professor of Regional Economic Development at Western Carolina University.

M. Danish Shakeel is a professor and director of the E. G. West Centre for Education Policy at the University of Buckingham, UK.

Abstract

Chetty and others (2022) say county density of cross-class friendships (referred to here as "adult-bridging capital") has causal impacts on county inter-generational mobility rates within the United States. In models based on social psychological and educational research, we instead find that county mobility rates are a function of county density of family capital (higher marriage rates and two-person households), community capital (community organizations, religious congregations, and volunteering), mean student achievement in grades 3-8, and cross-class friendships in high school. Our models use the same dependent variable, similar regression equations and similar control variables employed by Chetty but also include state fixed effects, student achievement, and family, community, school-bridging (cross-class high school friendships), and political (participation and institutional trust) capital. R-squared increases from 0.82 to 0.84 when adult-bridging is incorporated into the model. We infer that mobility rates are shaped primarily by dual-parent presence, supportive community institutions, student achievement and cross-class friendships in high school. To enhance mobility, public policy needs to enhance the lives of disadvantaged young people at home, in school, and in communities, not just the social class of their friendships as adults.

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Social capital, a set of psychological predispositions generated by social relationships, lies at the boundary between the sociology and psychology disciplines. A vital resource produced by exchanges among individuals (Coleman, 1990), it may generate trust needed to solve common problems (Ostrom, 1990), stimulate educational achievement and attainment (Coleman 1988), enhance human flourishing (Vanderweele, 2017) and stimulates economic and political modernization (Fukuyama, 1995; Inglehart, 1997; Putnam, 1993). Chetty et al. (2022), hereinafter Chetty, tells us that cross-class friendships comprise a type of social capital that generates inter-generational mobility. We find instead that a county's density of positive social psychological relationships formed within families and communities, together with the educational performances achieved by students in elementary and middle school, are the best predictors of county social mobility rates. When these variables are included in the model, the magnitude of the relationship between cross-class friendship and mobility rates within a county decreases noticeably. We conclude that family, community, and school factors are more critical for inter-generational mobility than the friendship patterns formed by adults. Indeed, the latter are more likely to be the consequence, than the cause of social mobility.

Chetty says cross-class friendships, labeled "economic connectedness (EC)," create an opportunity structure for those from low-income backgrounds. Specifically, they assert that: "areas with higher EC have large positive causal effects on children's prospects for upward mobility (p. 120)." After examining friendship patterns among 72 million Facebook users in 1,818 counties, they report that EC has a greater effect on mobility than does household income, racial and income segregation, or income inequality. In a model that controls for these variables, they show a large impact of EC on intergenerational mobility (p. 117).

The study has captured national attention *(*Economist, 2022; Miller et al., 2022) and received favorable reviews (Jackson & McMillan, 2022; Joseph, 2022; Powell & Toppin, 2022; Tropp & Naeem, 2022). The *New York Times* (Miller et al., 2022) informed its readers that:

> an expansive new study, based on billions of social media connections, . . . helps explain why certain places offer a path out of poverty. For poor children, living in an area where people have more friendships that cut across class lines significantly increases how much they earn in adulthood.

A Brookings institution report summarizes the study as follows:

> The findings are striking and certain to have a profound impact on discussions of economic mobility. The headline finding is that at the community level, cross-class connections boost social mobility *more than anything else (their italics)*, including racial segregation, economic inequality, educational outcomes, and family structure (Reeves & Fall, 2022).

The study has been well-received not only because it observes millions of Facebook friends and calls attention to the importance of social capital for intergenerational mobility but also for its policy implications. If Chetty is correct, the best way to create more equal opportunities in an inegalitarian society is to break barriers to the formation of cross-class friendships. If such friendships are the primary determinant of social mobility for the disadvantaged, school and residential policies should encourage their formation. The research has major implications for school tracking, honors programs, merit scholarships, merit-based admissions to schools and colleges, neighborhood desegregation, zoning regulations, housing policy, and much more (Jackson & McMillan, 2022; Reeves & Fall, 2022).

As well-received and significant as Chetty's research has been, questions remain. In this paper we first replicate the Chetty cross-class friendship model, then show models based on social psychological and educational research that include student achievement, state fixed effects and four social capital variables—family, community, political and school-bridging capital. Our procedure uses much the same county-level data and measures for all characteristics included in their main model, and, apart from adding new variables, we use the same multiple regression equation to estimate effects on social mobility. We prefer unweighted observations to weighting them by the size of their disadvantaged population, as Chetty prefers, but the findings emerge just as clearly when weights are applied.

We make terminological adjustments. Most importantly, we follow Granovetter (1973) by referring to density of cross-class friendships in school as bridging capital rather than EC, and we distinguish between bridging in high school and, later, as an adult.

When state fixed effects are added to the alternative model, the correlation between adult-bridging capital and mobility drops markedly, suggesting that the Chetty findings may be driven by unobserved factors that vary across states. When student achievement and four additional social capital variables are incorporated into the model, adult-bridging capital is shown to be less closely associated with inter-generational mobility than family capital. In our preferred model, student achievement, community capital, and school-bridging capital also emerge as significant determinants of mobility. In other words, adult friendships that cross class lines, far from being the major determinant of inter-generational mobility, appear to be, at best, no more than one piece of the puzzle.

Theoretical questions arise as well. Cross-class friendships can be the consequence as well as the cause of social mobility. Indeed, the two are intertwined almost by definition. Adult-bridging capital in a county is, in part, a function of the "*share of high-SES individuals in an area* and partly by differences in the rates at which low-SES individuals befriend high-

SES individuals (p. 110, our italics)." A county with a larger percentage of high-status individuals is also likely to be a county in which other factors generate higher rates of inter-generational mobility. Adult-bridging may well be the consequence of a greater density of upwardly mobile individuals in a county. Also, adult-bridging is observed in 2022, seven years later than the year (2015) inter-generational mobility is observed. If the bridging variable were the cause, not the consequence, of inter-generational mobility, friendship patterns in 2022 would need to be in place 20 to 30 years earlier when the cohort of adults between the ages of 25 and 40 observed on Facebook were children and adolescents. Further, those bridges would need to be independent of other determinants of inter-generational mobility in place at that time.

Recognizing the endogeneity problem, Chetty offer school-bridging capital (cross-class friendships in high school) as a robustness check. They show a moderately positive relationship between a likely exogenous measure of school-bridging and mobility. Yet they do not employ this likely exogenous factor in their main analysis, clinging instead to the problematic adult-bridging variable.

We propose alternative models that estimate county-level inter-generational mobility rates with controls for variables similar to those used by Chetty but which add student achievement, several social capital variables, and state fixed effects. In our preferred model, inter-generational mobility is correlated with student achievement (0.19), family capital (0.44), community capital (0.07), political capital (0.03, not sig.) and school-bridging capital (0.11). R-squared is 0.82; it increases to just 0.84 when adult bridging is added to this model. We conclude that the Chetty claim is fragile. Instead, family and community capital, together with student achievement and high-school friendships, appear to be the determinants of social mobility for disadvantaged young people. If this alternative model identifies causal relationships, then equal opportunity policies should focus on strengthening families, schools,

and communities. Cross-class friendships may be worth encouraging but they are hardly sufficient.

The remainder of this paper is organized in the following way: 1) review and assessment of the Chetty model, 2) social capital theory and measurement, 3) data, 4) analytical strategy, 5) results, 6) robustness checks, and 7) discussion.

Review and Assessment of Chetty Model

Chetty reports that social mobility is largely a function of cross-class friendships. The scholars are to be congratulated for the magnitude of the data they have assembled and praised for sharing county-level data with the research community, but their boldly stated claim that cross-class friendships are the primary, causal determinants of social mobility is problematic (Chetty et al., 2022, p.120):

> the share of high SES friends among low SES people . . . is strongly associated with upward income mobility, whereas other forms of social capital are not. Areas with higher . . . [shares of such friendships] have large positive causal effects on children's prospects for upward mobility.

Inter-generational mobility

The Chetty group define intergenerational income mobility in relative terms as "children's chances of rising up the income distribution conditional on growing up in low-income families (p. 113)." Chetty's estimates of intergenerational mobility, taken from U. S. tax records, is the best available county-level indicator of relative social mobility in the United States (Chetty et al., 2014; Chetty et al., 2018; Chetty & Hendren, 2018).[1] It estimates

[1] Inter-generational mobility can be defined in either absolute or relative terms. When defined absolutely, most indicators show steep upward trends in SES mobility. College graduation rates have increased from 8% in 1960 to 38% in 2020 (Statista, 2022). Eighty-four percent of all adult children earned (after

the percentile of the income distribution of those born into households at the 25th percentile of the socio-economic distribution. The index captures the mobility of the disadvantaged segment of the population, not the mobility of the county's total population. The index tells us what kinds of counties provide the greatest opportunity for those born into low socio-economic households to achieve higher levels of relative income.

Cross-class friendships (adult-bridging capital)

EC is defined as "the extent to which different types of people (for example, high income versus low income) are friends with each other" (p. 109). The concept builds on the work of Granovetter (1973, 1974, 1985, 1992) and Lizardo (2006) who theorize that "weak" ties within a social network offer a better bridge to the outside world than "strong" ties that bind individuals together within a cohesive but closed social network. Chetty measures the amount of adult-bridging capital in a county by doubling the average percentage of friendships of a Facebook user from below median socioeconomic (SES) backgrounds in the county who are friends with users from above median SES backgrounds. The measure makes use of 2022 "data on the social networks of 72.2 million users of Facebook aged between 25

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adjusting for inflation) more income between 2000 and 2008 than their parents had by a similar age. For those born into the lowest quintile of all households, that percentage was 93% (Urahn et al., 2012; also, see Gramm, Ekelund, & Early, 2022, pp 119-164; but see Opportunity Insights, 2023).

There is less consensus with respect to relative mobility. Zhou (2019, p. 459) finds that increasing college graduation rates "is unlikely to boost intergenerational mobility among college graduates." Some report less mobility in the United States (Beller & Hout, 2006), while others report roughly equivalent rates across Europe and the United States (Breen & Meuller, 2020; Winship, 2018). Relative mobility, it is to be noted, is a zero-sum game. For every step upward in SES ranking a person takes, another person must take a step downward. Unlike absolute mobility, where in principle everyone in the current generation can be better off than their ancestors, there must always be both winners and losers on a scale that measures relative social mobility.

Relative mobility can vary from none to completely random shifts in the SES distribution from one generation to the next. Few societies would prefer either extreme. If social mobility were zero, then all children would hold the same SES rank as their parents, a rigid caste system that would leave a nation unable to make full use of citizen talents. But if SES distributions changed at random from one generation to the next, nations would suffer from under-investment, as parents would have less incentive to invest in their children's human capital.

and 44 years to construct . . . new measures of social capital for each [county and] ZIP code in the United States (p. 108).” Chetty reports a large bivariate relationship between county density of adult-bridging capital and county-level inter-generational mobility rates.

Chetty constructs other indicators of social capital: a) share of overlapping friendships (e. g., how often two of a person’s friends are also friends with each other), b) civic organizations (number of Facebook pages per 1000 users in a county with a category classified as “public good,” c) volunteering (percentage of Facebook users who say they are a member of a volunteering or activist group). They also make use of the Penn State index of political capital discussed below. In bivariate analyses, counties with a greater share of adult-bridging capital are shown to be highly correlated (0.64) with counties which have experienced greater upward mobility (Figure 3a, p. 114), while insignificant and weak relationships are observed between mobility and clustered friendships (-0.00sd), community organizations (0.06sd), volunteerism (0.18sd), and the Penn State index (0.12sd). As Chetty put it, “the incremental R-square of including EC conditional on all the other social capital measures is an order of magnitude larger than the incremental R-square of including any of the other measures (p. 115).”

After making these comparisons, the Chetty team’s presents its core results in Figure 5b (p. 117). The graph shows the effects of EC controlling for six other plausible determinants of social mobility, percent black, racial segregation, Gini index of inequality, mean income, third-grade math scores, and percent single-parent households. Replicated here in Table 3, model 1 (in tabular form), the model estimates substantial adult-bridging effects (0.49) on mobility even after adjusting for these other factors. (To provide direct comparisons with alternative models presented below, the estimates in the tabular version of model 1 vary somewhat from those displayed graphically in Chetty’s Figure 5b. In a robustness check

below, we show that the minor change in counties included in the analysis do not materially alter the results.)

Questions

Despite the sizeable coefficient between adult-bridging and mobility, the study's causal claims raise questions about a) the direction of the causal arrow, b) the absence of state fixed effects, and c) the minimal discussion of family structure.

Endogeneity

The Chetty team itself acknowledges the potential endogeneity of the association of bridging capital with inter-generational mobility: "Because friendships and SES are measured in adulthood, economic connectedness [adult-bridging] may itself be influenced by rates of intergenerational mobility (p. 119)." To address the concern, they present an indicator of cross-class friendship patterns in high school (referred to here as school-bridging capital), saying that "because childhood friendships are made before people start working, they cannot be directly influenced by rates of economic mobility (p. 116)." The indicator estimates parents' socio-economic status of the five closest high school Facebook friends. The bivariate relationship between density of school-bridging capital and mobility is 0.41. Though less than the 0.64 bivariate correlation with adult-bridging capital, this measure of bridging raises much less concern about potential endogeneity, and we use it in our preferred model below. Oddly, the Chetty group eschews that approach, relying instead upon the adult-bridging indicator for their main analysis (Figure 5b, p. 117).

Racial patterns

A second effort to buttress the causal claim divides the sample into predominantly white and minority counties. Adult-bridging correlates with mobility in both types of counties. That may show that the correlation is not a function of racial segregation or white

flight, but it hardly demonstrates that cross-class friendships occur prior to rather than as a consequence of inter-generational mobility.

Childhood residence

In a third effort to defend the causal claim, the Chetty group focuses on the effects of "growing up from birth (for 20 years) in [a high bridging] county instead of the average county in the United States." They report that "higher [adult-bridging] counties have larger causal effects on upward mobility, with a [bivariate] correlation of 0.44 (p.116)." That suggests that cross-friendships as an adult in 2022 are correlated with mobility among those born between 1978 and 1983 who did not move from their home county for the first twenty years of their life. But it does not show whether the mobility occurs before or after friendships were formed. The endogeneity issue remains acute because the density of cross-class friendships are in part a function of the "*share of high-SES individuals in an area* and partly by differences in the rates at which low-SES individuals befriend high-SES individuals (p. 110, our italics)." A county with a larger percentage of high-status individuals is likely to be a county that has higher rates of inter-generational mobility for any number of reasons.

In sum, Chetty provides no convincing evidence that adult-bridging has a causal impact on inter-generational mobility. However, it makes a solid case for measuring bridging capital by estimating the density of cross-class friendships in school rather than as an adult. We use this variable in our analysis below.

State-fixed effects

Differences across states account for nearly two-thirds of the variation in inter-generational mobility. (In an equation that includes only state fixed effects as predictor variables, adjusted R-squared = 0.62). A wide variety of social, cultural, and institutional differences among the states, many of them unobservable with currently available data, could

account for inter-state differences. Including state fixed effects narrows the challenge of identifying causal relationships by focusing attention on only within-state variation, which accounts for better than a third of the total. When state fixed effects are included in Chetty models with unweighted observations, the correlation between adult-bridging and mobility declines from 0.64 to 0.34 (Table 3. model 3). In other words, much of what Chetty et al. attribute to adult-bridging capital is the likely consequence of unobserved factors that vary among the states. Fortunately, enough within-state variation remains to estimate effects that are not biased from the inclusion of between-state effects on mobility rates.

Ignoring family capital

In their main model, Chetty includes as one of its control variables an indicator of family social capital—county density of single parent households—that shows a strong negative (-0.41) relationship to mobility in their main model. That coefficient softens to -0.28 when estimated with unweighted data but returns to -0.45 when state fixed effects are introduced. In other words, in a model unaltered except to narrow the focus to variation within states, Chetty's own measure of family capital (single parent households) shows a stronger relationship with inter-generational mobility than adult-bridging capital. Yet this relationship is not discussed.

In the following section we present various forms of social capital and several indexes that have been designed to measure it. We then drawn upon social psychological and educational research to build a model that offers an alternative to Chetty's research design and interpretation. We present information that may assist readers when deciding whether the alternative model is causal.

Social Capital Theory and Measurement

Inasmuch as social capital refers to psychological predispositions generated by social relationships, it lies at the boundary between the sociology and psychology disciplines. In James Coleman's words, it emerges out of the "obligations and expectations" that arise from the relationships among individuals. It is a function of the "trustworthiness of the social environment, information-flow capability of the social structure, and norms accompanied by sanctions" (Coleman, 1998, p. S119, as quoted by Jackman & Miller, 1998, pp. 48-49). Social capital is thus one kind of human capital, which Becker defines as "activities that influence future monetary and psychic income by increasing resources in people" (Becker, 1964, p. 11; also, see Rees, 1965; Solow, 1965). We extract from the literature theoretical propositions about four types of social capital—family, community, political and bridging—that are likely predictors of student achievement and inter-generational mobility.

Family capital

Coleman (1988, pp. S109-S113) shows that social capital contributes to the academic development of the child. The household income and parental education of children affects their achievement levels, but so do the relationships between parents and children, which Coleman sees as a type of social capital. He says the time and energy necessary to sustain these relationships are more prevalent in dual parent households, on average. He finds that dual parenting reduces high school drop-out rates even after adjustments for household income and parental education. Since Coleman, numerous studies have reached similar conclusions (Duncan & Murnane, 2011; Jencks & Peterson, 1991; Jencks & Phillips, 1998; Kwon, Heflin, & Ruef, 2013; Lim & Putnam, 2010). Teachman et al. (1997, p. 1355) find that "social capital enhances the likelihood that financial and human capital will be transferred to children in the form of increased human capital." Kalil et al. (2014) report that biological children living with both parents spend more time with their parents than do those in single-parent households, yielding higher levels of student achievement (Fiorini & Keane,

2014). Another study shows the more a mother reads to their child, the higher the reading performance (Price & Kalil, 2019). After reviewing multiple studies (Kearney 2023, p. 132) concludes that boys are especially disadvantaged "when they grow up in a home without a dad." In a systematic review of 102 studies of child and adolescent well-being, McPherson et al. (2013) report that those "living in a two-parent household . . . reported better outcomes. . . . Moreover, [they] . . . particularly benefit from having a positive relationship with their parents and being raised in a family where joint activity and good communication are present."

The benefits of two-parent households spill over to others outside the family (Kearney 2023, pp. 139-143). An increase in the percentage of single-parent homes in an area has been found to be a driver of increased income inequality (Martin, 2006; Haskins and Sawhill 2016). Chetty et al. (2014, p. 1616 and also see Chetty & Hendren, 2018; Chetty et al., 2020), find "the fraction of children living in single-parent households is the single strongest correlate of upward income mobility among all the variables we explored." In seminal work, Wilson (1987) shows the ways in which male unemployment, racial barriers, and concentrated poverty in urban neighborhoods contributed to persistent intergenerational impoverishment by isolating young people from supportive social networks provided by appropriate adult role models and stable, two-parent families.

Measuring family social capital at the county level

To estimate a county-level family capital index, we extract the first principal component from a matrix of the following variables: a) share of births in 1982 to women who were married, b) 1980 share of households with a married couple, and c) share of own children living in a single parent home.[2] The weights of the three variables load on the first

[2] See Table A1 for details.

principal component at 0.56, 0.59, and -0.58, respectively. The first principal component captures 93% of the variance. Quite apart from parental time and engagement, the family capital index captures other dimensions of parental human capital, most especially parental education and household income, well-documented determinants of student achievement, educational attainment and adult earnings (Duncan, Featherman, & Duncan, 1972: Goyette, 2008; Jacob & Linkow, 2011; Kao & Tienda, 1998; Kearney, 2023; Sewell, Haller, & Ohlendorf, 1970, Sewell, Haller, & Portes, 1969, Teachman and Paasch, 1998). Following Chetty, our preferred model controls for county median income, racial composition, and other variables but does not control for levels of educational attainment. However, results do not change materially when educational attainment is controlled (see robustness check).

Community capital

Coleman says that close ties among parents, teachers and other adults within a community generates educationally productive social capital, resulting in lower drop-out rates at Catholic than public schools (Coleman 1988, pp. S114-S116) even when family income and education levels are controlled. Kwon, Heflin, and Rauf (2013, p. 890) also find that "the benefits of social trust and organization membership accrue not just to the individual but to the community at large" by creating networks that facilitate opportunities for self-employment. However, recent social psychological research and educational research has not shown a consistent pattern of community capital effects on student achievement. Whereas Shriner, Mullis and Schlee (2009), estimate positive impacts on reading, others find no relationship (Condron, 2009: Freeman & Condron, 2011, Geven & van de Werfhorst, 2020). Morgan and Todd (2009) find no impacts of community capital on math performance in public schools but positive ones in Catholic school. In a well-designed experimental study, Gamoran et al. (2021), find no effects on achievement of an intervention seeking to enhance

community social capital by bringing groups of small groups of disadvantaged public school parents together for eight weekly sessions plus monthly follow-up activities.

Community capital has also gained the attention of political scientists seeking to explain differences in the rate of political development across nations and regions (Fukuyama, 1995; Inglehart, 1997; and Putnam, 1993, 1995a, 1995b, 2000, 2016). In an influential study, Harvard political scientist, Robert Putnam (1993), argued that higher levels of social capital in northern Italy—its choirs, sports leagues, and other voluntary organizations—propelled its economic and political development. Meanwhile, the family-centered, isolative culture of southern Italy hobbled community co-operation, political trust, and democratic institutions.

Putnam (1995a, 2000; see also Putnam & Campbell, 2012) tracks deterioration in community co-operation in the United States, which is attributed to a decline in the number, size, and density of local voluntary associations and other forms of social engagement. In *Our Kids* (2016), Putnam, like Wilson (1987), laments the disappearance of dense social networks that once linked residents across class lines. The departure of the upper middle class to socially exclusive settings in well-to-do neighborhoods left other once healthy neighborhoods with fewer voluntary associations.

Most measures of community capital are available only at the national level (Alesina & Ferrara, 2000; Lee & Kim, 2013; Legatum Institute Foundation, 2017; National Conference on Citizenship, 2006), but the Joint Economic Committee of Congress (U. S. Congress, Joint Economic Committee, 2017, hereinafter JEC) has compiled several county-level indices. For our measure of community capital, we use a date-appropriate version (see timing discussion below) of JEC's community health index. The index includes indicators of

a county's density of religious congregations and its density of non-religious non-profit organizations. See Table A1 for details.

Political capital

Discussions of political capital and community capital are often intertwined in the research literature. Putnam (1995b, pp. 664-65) defines social capital as the "features of social life—networks, norms, and trust—that enable participants to act together more effectively to pursue shared interests." Inglehart (1997, p. 188, as quoted by Jackman & Miller, 1998), in his report on declining social and political trust in industrial democracies, points to the overlap between the two concepts when he states that social capital arises out of "a culture of trust and tolerance, in which extensive networks of voluntary associations emerge." Here we distinguish between community capital, the organizational life of a county, from political capital, the county's degree of citizen trust in political institutions. Empirically, the two types of capital may reinforce one another, but conceptually the organizational life of the community differs from the psychological predisposition to trust government institutions.

A group of scholars at Pennsylvania State University, has constructed a political trust index for counties within the United States, which is referred to as the Penn State index. (Rupasingha, Goetz, & Freshwater, 2006). At the county level, this index is based upon county-level measures of electoral participation rates and responsiveness of citizens to requests from the U. S. Bureau of the Census to mail in household demographic information.[3] Chetty et al. (Extended Data Table 2) shows a 0.06sd bivariate correlation between the Penn State index and inter-generational mobility. We construct a similar index for the period when

[3] This index is similar to the county-level index of institutional health compiled by JEC.

the relevant cohorts were in high school and transitioning from adolescence to adulthood (see below). See Table A1.

School-Bridging capital (cross-class high-school friendships)

Granovetter (1973) theorizes that weak ties in social networks form bridges to opportunity for disadvantaged children. Such bridges are especially important for young people as they transition from school to higher education and to the workplace. The importance of peer relations was noted as early as 1961 when Coleman, in *The Adolescent Society* (1961), found that high school students care more about peers than about teachers, grades, and coursework. Later, Coleman et al. (1966) found that the achievement of black students was positively affected by the presence of white peers. This finding provided the scholarly underpinning for the school desegregation movement during the subsequent decade (Rivkin & Welch, 2006).

Not everyone agrees that school-bridging capital has positive impacts on a disadvantaged student's opportunity structure. Ogbu (2003) and Fryer (2006) suggest that peer group culture in minority communities may undermine student achievement. On the other side, Cook and Ludwig (1998) report high-performing minority students are popular with their classmates. To estimate the effects of county-level school-bridging capital, we use Chetty's school-bridging variable described above.

Student Achievement

The road to economic success runs through the schoolhouse. The number of years of schooling, the completion of high school, college enrollment and degree attainment all predict future earnings, employment rates, household wealth, and other socio-economic outcomes (Becker, 1964; Becker, & Chiswick 1966; Denison, 1962; Jencks, 1979; Mincer, 1957, 1970, 1975; Schultz, 1961).

It is not just the length of schooling. What students learn in school is critical for long-term life outcomes as well. Student performance on standardized tests in math and reading in 8th grade predicts high school graduation, college attainment, future earnings, teenage pregnancy rates, physical and mental health, and political participation (Borghans et al., 2016; Chetty, Friedman, & Rockoff, 2014). Also, nations that show higher average levels of student achievement enjoy faster rates of economic growth (Barro, 2001; Hanushek & Woessmann, 2008, 2012). For nearly a century prior to the Covid pandemic, substantial progress in U. S. student achievement had been made, especially by disadvantaged students (Shakeel & Peterson, 2022).

To measure student achievement levels by county, we use data available at the Stanford Education Data Archive (SEDA) which contains mean county-level student test performances in math and reading in grades 3 through 8 for the school years between 2008/2009 and 2017/2018 (Fahle et al., 2021; Reardon et al., 2021). The archive contains information on state tests required by the 2002 federal law, No Child Left Behind. Every school district administers tests in math and reading annually to students in grades 3 through 8 and again in high school. Each state administers its own set of tests, but SEDA places all states on a common scale via student performance nationwide on tests administered as part of the National Assessment of Educational Progress (NAEP), which is given bi-annually to representative samples of 4th and 8th grade students in each state. Our preferred analysis, which makes use of state fixed effects, does not depend upon the validity of the assumptions made to construct the common scale.[4] We report county mean performances of all students

[4] We prefer the indicators available from SEDA to 3rd grade math achievement taken from the Global Report Card (Greene & McGee, 2012), which Chetty et al. prefer. SEDA and the Global Report Card make use of the same state proficiency tests required by federal law, the former is better documented and remains generally accessible to the research community.

as well as mean performance of students from disadvantaged backgrounds, as indicated by eligibility for participation in the federal free and reduced-price lunch program.

We prefer math to reading scores in our preferred model, as prior research suggests the economic returns to math skills are larger (Hanushek & Woessmann, 2008, 2011, 2012), but similar results are observed for reading (Table A2). We prefer the math achievement of all students, not just the disadvantaged ones, as the former gives a more complete indicator of county student performance levels. Results remain much the same regardless of the indicator used. To obtain a long-term achievement indicator, we prefer math results for all years 2009 through 2018 to just those for 2009, the year most proximate to the time when the cohort of interest was in school. But results do not depend on this analytical decision (See Appendix A. Table A3.)

Summary

The literature has identified a variety of practices that generate social capital that may foster inter-generational mobility, and various scholarly teams have constructed indices that measure their formation and persistence. Family, community, political, and school-bridging capital are all potential determinants of student achievement and inter-generational mobility. In the remainder of this paper, we explore the relationships among these variables, social capital and adult-bridging capital.

Data

Social capital is an amorphous concept difficult to pin down to a specific place and time. But inasmuch as all measurements are taken at specific places and times, assumptions must be made with respect to the permanence or stickiness of social capital.

County data

Data availability dictates county-level estimates of social capital, but there are also substantive reasons to prefer a county-level analysis. Social capital spills across adjacent spaces, making larger units more appropriate for analysis than zip codes or census tracts (Durlauf & Fafchamps, 2005). Still, estimates at the county level may be imprecise and perhaps biased when counties are large and diverse, though it is not clear whether the bias is upward or downward.

Chetty (Appendix, p. 3) has made available data on bridging capital, social mobility and the control variables used in their analysis for the 1,818 out of 3,148 counties in the United States that have two or more census tracts and a population of more than 20,000. Smaller counties have been excluded because racial and income segregation could not be reliably estimated in these areas. The 1,333 counties included in our preferred Model (Table 3, Model 5) are identical to those used by Chetty except that we lose an observation when adding the school-bridging variable, 3 observations when adding the family index, 138 observations when adding the political index, and 341counties when adding the community index. We lose another three observations when using estimates of achievement for disadvantaged students. Results are not sensitive to changes in number of counties included in the analysis. See robustness check.

Period

The literature tells us that social capital resembles an ancient forest. It takes generations to come to fruition, but is then self-sustaining, though may be destroyed by predation. No one makes these points better than Putnam (1993, pp. 137-162), who attributes modern differences between northern and southern Italy to differential practices that have their origins at least as early as the 18th Century. Church choirs, Masonic lodges, and drinking

clubs created vibrant communities in Tuscany and other regions in northern Italy. In Sicily, Naples and other southern regions, authoritarian institutions left the region less able to adapt to modernity. Elsewhere, he suggests social capital is easier to squander than to build: Modern communications, mass media, and isolative forms of entertainment may be gradually undermining civic life and social capital (Putnam, 1995a, 1995b, 2000). Similarly, the JEC report (2017, pp. 38.40) worries that social capital is being dissipated:

> What we do together has become more circumscribed than it used to be. . .. We may be materially richer than in the past. But with atrophied social capabilities, with a diminished sense of belonging to something greater than ourselves, and with less security in our family life, we are much poorer for doing less together.

If social capital is self-perpetuating and erodes only gradually, then the precise moment it is measured is not particularly consequential. But if it deteriorates quickly, measurement issues arise when data are not available for the period when a certain type of capital is most relevant for human development. Even so, most researchers, including JEC, presume a degree of stickiness of over the course of a decade or so. Both its and the Penn State indexes are built with variables that span nearly a decade.[5] Chetty assembles its indicators of bridging capital in 2022 from a generation of Facebook users (those aged 25-44) to predict mobility that measured seven years earlier, and the study offers them as the causal explanation for the future mobility of those born in 1978 to 1983.

Subject to data availability, we estimate each kind of social capital at the time most proximate to the point in the life cycle when those born between 1978 and 1983 are especially likely to benefit from it. Data on family capital is for 1980 to 1982, when the

[5]The JEC social capital index and Putnam's index correlate across states at the 0.81 level, despite the fact that Putnam's data comes from the second half of 1970s through the first half of 1990s and the JEC index comes from 21st century data (see table 4 in Social Capital Project p. 32).

cohort was no more than four years of age, a period when parenting is especially crucial for the formation of human capital. (Heckman, 2006). Community capital is measured around 1990, when the cohort, aged 7 to 12, on the cusp of adolescence when religious and secular community institutions can be expected to play a role in the life of a maturing child. Political capital index is constructed from data obtained for the years 1988 to 1996, when the cohort is as young as 5 and as old as 18, again a period when trust and engagement in political institutions might be of special significance to a young person. Data availability precludes a measure of student achievement before 2009, when even the youngest members of the cohort have finished school. That requires the assumption that county levels of achievement do not vary by much over the course of a decade. In a robustness check, we show that county math achievement in 2018 predicts social mobility about as well as the 2009 indicator. School-bridging capital, drawn from Chetty, is based on recollections of friendships in high school when the cohort has reached adulthood.

Analytic models

In our preferred estimate of the determinants of inter-generational mobility (Table 3, Model 5) we regress this outcome on county-level indices of mean student achievement and the forms of social capital discussed above. We retain the control variables used in the Chetty study, except we substitute achievement in grades 3 through 8 for its indicator of 3rd grade math scores, the family capital index for its indicator of single-parent households, and the school-bridging index for the adult-bridging index. Preferred estimates are unweighted and include state fixed effects, c_s. In our preferred model, standard errors are clustered by state. Table 3, Model 4 displays results from the following equation:

$$social\ mobility_{is} = \beta_1 adult\ bridging_{is} + \beta_2 school\ bridging_{is} + \beta_3 achievement_{is} + \beta_4 family_{is} + \beta_5 community_{is} + \beta_6 political_{is} + X'\gamma + c_s + \varepsilon_{is} \quad (1)$$

Model 5, our preferred model, is identical except that we do not include the endogenous adult-bridging variable. Model 6 is identical to Model 5 except the achievement variable is for economically disadvantaged students. In subsequent tables, we estimate the determinants of adult-bridging, school bridging, and student achievement with the following equations:

$$adult\ bridging_{is} = \beta_1 school\ bridging_{is} + \beta_2 achievement_{is} + \beta_3 family_{is} + \beta_4 community_{is} + \beta_5 political_{is} + X'\gamma + c_s + \varepsilon_{is} \quad (2)$$

$$school\ bridging_{is} = \beta_1 achievement_{is} + \beta_2 family_{is} + \beta_3 community_{is} + \beta_4 political_{is} + X'\gamma + c_s + \varepsilon_{is} \quad (3)$$

$$achievement_{is} = \beta_1 family_{is} + \beta_2 community_{is} + \beta_3 political_{is} + X'\gamma + c_s + \varepsilon_{is} \quad (4)$$

Results

Table 1 displays the mean and standard deviation as well as the maximum and minimum values for variables included in the analysis. Variables are then standardized to mean 0 and standard deviation 1 for the remainder of the analysis. Table 2 shows a matrix of their inter-correlations. Estimated predictors of dependent variables are given in Tables 3-6. Results are reported to three decimal places, though text rounds to two. In almost all models, family capital has the largest relationship to inter-generational mobility, but community capital, student achievement and school-bridging capital are significant as well.

[insert table 1 here]

[insert table 2 here]

Determinants of inter-generational mobility

Table 3, models 4, 5 and 6 report results from models that include student achievement in grades 3 through 8 and the four social capital variables described above. Model 5, our preferred model, substitutes school-bridging capital for adult-bridging capital, and it estimates achievement for all students, not just disadvantaged ones. Results show a strong connection relationship between family capital and inter-generational mobility (0.44). Student achievement (0.19), community capital (0.07), and school-bridging capital (0.11) are also statistically significant. Political capital is not. These estimates remain essentially the same when achievement levels of disadvantaged students are substituted for achievement levels of all students (model 6).

[insert table 3 here]

In model 4, which adds the likely endogenous adult-bridging variable, its coefficient of correlation with mobility is now only 0.31, less than the 0.41 coefficient for family capital in this model. Achievement (0.08) and community capital (0.06) remain significant predictors of mobility, but political and school-bridging capital do not. The value of R-squared (0.82) for model 5 is virtually the same as the 0.84 value shown for the one that includes adult-bridging capital (model 4). In other words, Chetty's main analytical variable adds very little to a better-specified equation that incorporates antecedent forms of social capital. Cross-class adult friendships seem to act, at best, as no more than a moderator of other forms of social capital. Earlier life experiences appear to be more significant for mobility than connections made as an adult.

Achievement

County density of family capital predicts county math achievement for all (0.21) students and, especially, for disadvantaged (0.32) ones. Community capital has little effect, a

surprise for scholars, like Putnam (2016), who associate the decline in community organizations with widening achievement gaps. However, the achievement measured here is for students in elementary and middle school. Community organizations—whether they be scouts, sports teams, choirs, or religious services may be more important for outcomes in high school and later in life. Meanwhile, another result runs contrary to expectations. Political capital, though shown to have no significant connection to social mobility or to school-bridging capital, turns out to have a significant (0.14) relationship with the achievement of all students, though not disadvantaged ones. This association between political capital and the school performances of all students could be endogenous. County residents may be more trusting of institutions when schools are more effective, though it is also possible that a politically trustful community enhances school quality.

[insert table 4 here]

School-bridging capital

When high school-bridging capital is predicted, both 8th grade achievement (0.21) and family capital (0.1) predict cross-class friendship relationships in high school (Table 5, Model 1), which may imply that bridges across class lines are the product, not a cause, of accomplishments. However, the achievement of disadvantaged students has no effect on high school friendship patterns (Model 2), a result anticipated by earlier studies of friendship patterns in high school that find talented students struggling socially when attending schools in communities with higher concentrations of disadvantaged students (Ferguson, Ludwig, & Rich, 2001; Fryer, 2006; Ogbu, 2003). Unexpectedly, community (-0.09) capital, far from facilitating friendships in high school, displays a significant negative relationship. The minus sign persists whether one measures achievement of all students or just disadvantaged ones. Community organizations may be less important for building bridges than previously

thought. However, in model 2 there is a small positive relationship between political capital and bridge building in high school.

[insert table 5 here]

Adult-bridging capital

In Table 6, adult-bridging capital becomes the dependent variable in two models, the first using an achievement estimate for all students, the second for disadvantaged students. In model 1, adult- and school-bridging capital are well-correlated (0.46); if a county fosters cross-class friendships in high school, adult friendships follow suit. One would be surprised to learn otherwise. Of greater interest, adult-bridging capital is a function of student achievement in elementary and middle school (0.34), which may suggest that early success at school yields cross-class friendships later on. Adult-bridging is only weakly predicted by family capital (0.09) and not significantly by community or political capital. A broadly similar pattern is evident if scores of disadvantaged students are used to estimate county achievement levels, except that political capital has a weak but positive correlation. We discuss these weak connections between adult-bridging capital and other forms of social capital below.

[insert table 6 here]

Robustness checks

We perform multiple robustness checks to ascertain whether our findings are sensitive to weighting decisions, to the counties, periods, and subjects chosen for the analysis, and to the inclusion of county educational attainment as a control variable. We also check sensitivity of models to the exclusion of state fixed effects. Only this last-mentioned variation materially alters estimates.

Weights

Chetty et al. weight counties by the size of the population below the national median income level. If each county is given equal weight, the correlation between adult-bridging and mobility increases substantially from 0.49 to 0.64 (Cf. Table 3, models 1 and 2). Given no theoretical reason to prefer a weighted to an unweighted analysis, we drop weights from our preferred analyses. Table A2 shows little change in our results when weights are included).

Subject and date of achievement tests

So as not to privilege achievement results for any one year, our preferred analysis (Table 3, Model 5) estimates the math achievement of all students in a county between 2009 to 2018, the years for which this information is available. We obtain essentially the same results for reading achievement (Table A3). We also obtain similar results if we only use the math results for only 2009 and, separately for 2018, years most and least proximate to when subjects were in elementary and middle school (Table A3). The results imply stability of county achievement levels across a decade, lending credibility to the assumption that relative county achievement levels observed in the early 21st Century had not changed much since the time subjects were in school.

Timing and number of county observations

As a robustness check we duplicate our preferred analysis using the JEC indices of community and political capital. Because JEC collected data for a more recent period, the use of their data allows for estimates using 2,625 counties. The results, shown in Table A4 resemble closely those in Table 3, model 5. Two inferences can be made: 1) results are not substantively affected by variation in county sample size; and 2) family, community and political capital are fairly sticky; measurements of these forms of capital taken two to three decades apart from one another predict inter-generational mobility equally well.

Education

To replicate Chetty as closely as feasible, we, in our preferred model (Table 3, model 5) do not include county educational attainment levels as a control variable. When we add them to the model (Table 3, models 7 and 8), county-level attainment levels do show a significant relationship with inter-generational mobility. However, family capital estimates remain at least as strong as in model 5, and other variables do not shift materially.

State fixed effects

Use of state fixed effects limits the analysis to the variation in mobility occurring within states. If all counties within each state have the same mobility rates, and if all mobility differences were between states, then, of course, use of state fixed effects would leave nothing to explain. In the case at hand, however, within-state variation in inter-generational mobility rates accounts for more than a third of the total variation. We are thus able to estimate social capital determinants of mobility uncontaminated by unobserved factors that vary among the states.

Table A5 shows the extent to which results change when state fixed effects are included in the model. The importance of family capital remains essentially unchanged, as does the role played by student achievement and community capital. However, the association between bridging capital and mobility is highly sensitive to the exclusion of state fixed effects. We infer that much of what Chetty attributes to bridging capital is in fact a function of unobserved differences among states, a strong indication that the bridging-mobility relationship is endogenous.

Discussion

Although we have only descriptive models, we present a diagram that shows a potential causal flow if one exists. We then discuss the plausibility of this causal flow, propose further research, and, finally, conclude.

Potentially causal model

The diagram displayed in Figure 1 assumes that family, community, and political capital are independent of one another but all affect achievement and high-school bridging capital. It also assumes high-school bridging capital is a function of elementary and middle school achievement, not the opposite. In other words, the causal flows from left to right. A tabular summary of the direct and indirect effects displayed in the figure is given in Table 7. The combined direct and indirect relationship between families and mobility is 0.50, by far the strongest relationship observed.

[insert Figure 1 here]

[insert Table 7 here]

If the relationships are causal, then counties which encourage the formation and retention of dual-parent households are counties that foster intergenerational mobility. Where marriages and two-parent families thrive, disadvantaged young people may be more likely to obtain the skills and develop the capacities that give them the opportunity to climb the opportunity ladder.

The relationship between student achievement and income mobility (0.21) is mainly direct, though some of its impact is mediated by school-bridging capital. If one acquires the needed skills in school, one is better equipped for a college or a career. Friendships in high school may also play a role, as higher achieving students are better placed to establish cross-class friendships, which are correlated with mobility at the 0.11 level. Political capital is of little consequence for mobility.

Community capital has a total 0.06 relationship to mobility. This effect is not mediated by either student achievement or school-bridging capital. Instead, community organizations seem to create some opportunities for mobility as a young person emerges from school and enters the broader community.

Models in columns 4, 5, and 6 in Table 7 add adult-bridging capital to estimations of a causal flow that assumes it is not endogenous but mediates the impact of other factors that affect inter-generational mobility and has a causal impact of its own. When this assumption is made, relationships between mobility and the other forms of capital do not change markedly. When it is included, total (direct and indirect), effects are the same for family capital (0.5), slightly larger for achievement (0.22), slightly larger for school-bridging capital (0.14), and slightly larger for community (0.08), and political (0.06) capital. If adult-bridging is actually exogenous, the relationship is 0.31, larger than for variables other than family capital (0.5).

Endogenous?

But are the connections displayed in Figure 1 causal? Do the densities of family, community and political capital, and the level of student achievement affect a county's inter-generational mobility rates? Or are these social psychological and educational forms of social capital determined by the level of adult-bridging capital in a county? Chetty reports a sizeable bivariate relationship between a county's cross-class friendships in 2022 and the mobility rate for those who were born and lived the early years of their life in that county (1980-1990s). If social capital is sticky across several decades, it is at least theoretically possible that a county's adult-bridging capital facilitates the formation and perpetuation of two-parent families, the development of community organizations, and the achievement level of students in the county.

That is theoretically possible, but the probability of such a causal chain is small. Adult-bridging capital predicts family at only the 0.15 level in a model estimated when a measure of math achievement for all students is included in the model (Table A6). Also, estimates of adult-bridging effects on community capital are insignificant, and impacts on political capital are just 0.1.

Adult-bridging predicts school-bridging at the 0.47 level. One could conclude that counties with cross-class friendships among adults facilitates similar friendships among high-school students, but one can just as easily conclude that cross-class friendships in high school foster similar adult friendships, or that both are happening. The relationship between a county's level of student achievement and its adult-bridging capital has a sizeable 0.45 coefficient, so it is possible that adult cross-class friendships in a county foster achievement despite the modest effects on family, community and political capital. But it is more plausible that higher achievers are more likely than lower achievers to develop a greater share of cross-class friendships both in school and as adults.

Future research

Considered altogether, the evidence casts doubt on claims that adult-bridging capital has a large impact on inter-generational mobility, but, for some readers, it may remain an open question as to whether family and, perhaps, community capital, together with student achievement, are the keys to inter-generational mobility. Finding a definitive causal answer to that question is no easy task—especially when data on county inter-generational mobility rates are available only for one year, 2015. More could be learned were individual-level data available, though social capital is inherently a product of social exchanges that take place in spatial settings.

At the aggregate level, traction might be obtained by exploiting the variation in social mobility across states. A geographical discontinuity analysis might identify counties at boundaries of some states that differ significantly in inter-generational mobility but are otherwise similar. One might also attempt to find events (disease, disasters, economic collapse) in some counties but not in others, which would facilitate an event study analysis that might allow for causal estimates. If inter-generational mobility trends prior to the event in the treated and control counties do not change or are moving in parallel directions, then a marked shift in their direction subsequent to a significant event could provide clues to the causal roles of various forms of social capital. Given the findings from this study, an event study analysis should probably look first for events likely to impact the amount of family capital. The Covid-19 shock might be exploited for this purpose, as the event seems to have had major but uneven effects on social and psychological well-being as well as academic performance. Other potential sources of exogenous variation include the following: Changes in public welfare policy (welfare and medical provision, child-care benefits, taxation policy), economic shifts (tariff policy, foreign competition, automation), and family laws and practices (abortion).

Conclusions and policy implications

Chetty's study of the connection between social capital and intergenerational mobility is an astonishing achievement both technically and substantively. It connects a massive amount of information on adult-bridging capital to the best available measure of relative social mobility. By linking these impressive data sets, Chetty focuses the social capital literature on important questions of social mobility and societal equity. The authors make a seemingly persuasive case that bridges built across class lines are the key to equal opportunity. Had their study actually identified causal impacts, the findings would have made a case for public policies that encourage residential and school desegregation across social

boundaries. Elite high schools and colleges, advanced placement courses, examination schools, tracking within school, zoning and other land-use policies would be arenas ripe for reconsideration. The findings, were they correct, would also have sent a disquieting message. If friendships are the key to success, then efforts to build social and human capital in homes, schools, and neighborhoods would seem less important. Playgrounds and basketball courts would appear to be more valuable than school libraries, honors assemblies, scouting programs and engaged parents.

But given the questions that surround the Chetty study, such policy recommendations are premature. We find very little evidence to support the major conclusion reached by the Chetty team that cross-class friendships, as observed on Facebook, are the form of social capital that creates the conditions for intergenerational mobility within a county. Instead, we find that a county's density of family and community capital, together with the performance of its students, are the best predictors of its social mobility. When these variables are included in the model, the size of the adult-bridging variable declines dramatically. When the adult-bridging variable is excluded, the amount of variance in social mobility that is explained is nearly as large. Very likely, adult friendships that cross class boundaries are mainly a consequence, not a cause, of social mobility.

If the alternative model developed here is causal, then policy should focus on strengthening families, schools, and communities. Social and political elites and others who rank high in social prestige should publicly celebrate, not denigrate, the two-parent family life that they themselves typically practice (Kearney, 2023). Their status and wealth should be put to the service of community institutions, both secular and religious. Welfare and health care policy should reinforce, not undermine, marriage ties. School boards and state legislatures should design schools that address the needs of the most disadvantaged students.

Since this study is descriptive, not causal, these policies are mentioned not to give definitive direction but to indicate the policy implications of social capital research. Our study should be seen as a building block that links the earliest research on social capital—which focused on specific forms of social capital—to future research which may causally identify the ways in which social capital, in its many manifestations, affects multiple dimensions of social life. Results suggest that capacities, habits, and character formed in the home, houses of worship, the community, and the school influence intergenerational social mobility. Working at different paces and having impacts at various times, these institutions and spaces create ladders of opportunity in a society. Cross-class connections may play a role as well, but this form of social capital hardly dominates the others. Very likely, it is not whom you know, but who you have come to be, that counts most of all.

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Table 1: Summary Statistics

Variables	Mean	St. Dev.	Min	Max
Relative social mobility	0.41	0.04	0.31	0.61
Adult bridging	0.80	0.17	0.36	1.36
Average math, all students	-0.01	0.24	-0.77	0.69
Average math, ECD students	-0.28	0.19	-0.88	0.29
Family	-0.12	0.77	-3.85	1.53
Community	-0.27	0.63	-1.57	2.49
Political	-0.02	0.97	-3.64	2.75
School bridging	0.87	0.22	0.26	1.61
Racial segregation	0.11	0.06	0.02	0.47
Percent single parents	0.27	0.06	0.10	0.54
Third grade math scores	3.31	0.67	1.14	5.18
Median household income	40,295	10,081	18,336	85,724
Percent black	0.09	0.12	0.00	0.70
Gini coefficient	0.29	0.06	-0.10	0.57

Note: These are unweighted estimates. ECD: economically disadvantaged students (i.e., those eligible for free- or reduced-price lunch). County level averages of student math achievement are based on the Stanford Education Data Archive 4.1 for grades 3-8, for years 2009-2018. N=1,333.

Table 2: Matrix of Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Relative social mobility	1.00													
(2) Adult bridging	0.73	1.00												
(3) Average math, all students	0.52	0.69	1.00											
(4) Average math, ECD students	0.42	0.44	0.83	1.00										
(5) Family	0.67	0.58	0.54	0.57	1.00									
(6) Community	-0.01	-0.13	0.00	0.12	0.08	1.00								
(7) Political	0.55	0.57	0.49	0.30	0.47	0.09	1.00							
(8) School bridging	0.50	0.69	0.53	0.17	0.30	-0.37	0.37	1.00						
(9) Racial segregation	-0.28	-0.31	-0.23	-0.35	-0.49	-0.13	-0.10	-0.09	1.00					
(10) Percent single parents	-0.64	-0.63	-0.66	-0.57	-0.83	-0.04	-0.43	-0.46	0.38	1.00				
(11) Third grade math scores	0.41	0.58	0.87	0.78	0.49	0.09	0.42	0.40	-0.25	-0.57	1.00			
(12) Median household income	0.30	0.56	0.52	0.13	0.18	-0.40	0.35	0.78	0.08	-0.46	0.40	1.00		
(13) Percent black	-0.60	-0.51	-0.46	-0.46	-0.80	-0.07	-0.43	-0.23	0.36	0.69	-0.40	-0.14	1.00	
(14) Gini coefficient	-0.61	-0.66	-0.56	-0.45	-0.68	-0.02	-0.64	-0.45	0.34	0.69	-0.51	-0.45	0.57	1.00

Note: See Table 1 and A1.

Table 3: Predictors of Social Mobility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Social mobility							
Adult-bridging	0.485***	0.638***	0.336***	0.308***				
	(0.052)	(0.041)	(0.038)	(0.047)				
Mean achievement				0.083**	0.188***	0.174***	0.157***	0.169***
				(0.035)	(0.048)	(0.041)	(0.050)	(0.040)
Family				0.414***	0.440***	0.416***	0.455***	0.433***
				(0.053)	(0.057)	(0.054)	(0.054)	(0.052)
Community				0.062**	0.065**	0.079***	0.056*	0.063**
				(0.029)	(0.028)	(0.029)	(0.030)	(0.029)
Political				0.029	0.031	0.049	0.026	0.035
				(0.032)	(0.032)	(0.032)	(0.031)	(0.031)
School-bridging				-0.029	0.113**	0.167***	0.078	0.100*
				(0.052)	(0.046)	(0.041)	(0.054)	(0.053)
% families with BA+							0.076**	0.120***
							(0.031)	(0.032)
Racial segregation	0.114*	0.105***	0.029	0.036	-0.005	0.005	-0.005	0.006
	(0.060)	(0.024)	(0.024)	(0.028)	(0.025)	(0.025)	(0.025)	(0.026)
Percent single parents	-0.413***	-0.283***	-0.454***					
	(0.064)	(0.039)	(0.060)					
Third grade math scores	-0.142***	-0.126***	-0.012					
	(0.044)	(0.028)	(0.031)					
Median household income	0.004	-0.220***	-0.200***	-0.057	-0.063	-0.015	-0.097**	-0.081*
	(0.052)	(0.042)	(0.048)	(0.050)	(0.055)	(0.057)	(0.048)	(0.047)
Percent black	-0.305***	-0.128***	0.067	0.101	0.119*	0.106*	0.118*	0.115*
	(0.059)	(0.031)	(0.052)	(0.061)	(0.066)	(0.062)	(0.066)	(0.062)
Gini coefficient	0.110	-0.123***	-0.028	-0.025	-0.044	-0.028	-0.075*	-0.080*
	(0.072)	(0.032)	(0.036)	(0.036)	(0.041)	(0.039)	(0.041)	(0.043)
State fixed effects?	no	no	yes	yes	yes	yes	yes	yes

All or disadvantaged?				all	all	ECD	all	ECD
Weights	yes	no	No	No	No	No	No	no
R-squared	0.694	0.655	0.837	0.830	0.816	0.817	0.817	0.821

Note: See Tables 1 and A1. In Column (1), observations are weighted by the population under the median income. In columns (2)-(8), observations are unweighted. In columns (1) and (2), standard errors are clustered by commuting zone. In the remaining columns, standard errors are clustered by state. *** p<0.01, ** p<0.05, * p<0.1. N= 1,333.

Table 4: Predictors of Achievement

	(1)	(2)
Variables	Mean achievement	
Family	0.205***	0.315***
	(0.054)	(0.058)
Community	0.009	-0.042*
	(0.022)	(0.022)
Political	0.142***	0.032
	(0.028)	(0.028)
Racial segregation	-0.050**	-0.077***
	(0.022)	(0.022)
Median household income	0.433***	-0.015
	(0.029)	(0.030)
Percent black	-0.244***	-0.208***
	(0.050)	(0.052)
Gini coefficient	0.084**	-0.024
	(0.032)	(0.037)
All or disadvantaged?	all	ECD
R-squared	0.756	0.680

Note: See Tables 1, 4, and A1.

Table 5: Predictors of School-Bridging

	(1)	(2)
Variables	School-bridging	
Mean achievement	0.209***	-0.029
	(0.049)	(0.040)
Family	0.101*	0.153**
	(0.056)	(0.057)
Community	-0.093***	-0.092***
	(0.023)	(0.025)
Political	0.025	0.055*
	(0.032)	(0.031)
Racial segregation	-0.092***	-0.105***
	(0.025)	(0.026)
Median household income	0.570***	0.660***
	(0.044)	(0.042)
Percent black	0.127**	0.070
	(0.051)	(0.056)
Gini coefficient	0.041	0.057*
	(0.034)	(0.033)
All or disadvantaged?	all	ECD
R-squared	0.804	0.793

Note: See Tables 1, 4, and A1.

Table 6: Predictors of Adult-Bridging

	(1)	(2)
Variables	Adult-bridging	
Mean achievement	0.342***	0.203***
	(0.050)	(0.046)
Family	0.087***	0.079**
	(0.032)	(0.038)
Community	0.010	0.030
	(0.021)	(0.020)
Political	0.008	0.045*
	(0.026)	(0.025)
School-bridging	0.459***	0.553***
	(0.046)	(0.046)
Racial segregation	-0.133***	-0.125***
	(0.017)	(0.017)
Median household income	-0.020	0.070
	(0.051)	(0.052)
Percent black	0.061*	0.013
	(0.032)	(0.031)
Gini coefficient	-0.064*	-0.036
	(0.034)	(0.034)
All or disadvantaged?	all	ECD
R-squared	0.846	0.832

Note: See Tables 1 and A1. Specifications include state fixed effects. Observations are unweighted. Standard errors are clustered by state. *** p<0.01, ** p<0.05, * p<0.1. N= 1,333.

Table 7. Total Social Capital and Achievement Relationships with Social Mobility (excluding and including Adult-Bridging)

	Adult-bridging excluded			Adult-bridging included		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Direct	Indirect	Total	Direct	Indirect	Total
Family	0.44	0.06	0.50	0.41	0.09	0.50
Community	0.07	-0.01	0.06	0.06	0.02	0.08
Political		0.03	0.03		0.06	0.06
Achievement	0.19	0.02	0.21	0.08	0.14	0.22
School-Bridging	0.11		0.11		0.14	0.14
Adult-Bridging				0.31		0.31

Note: See Figure 1. Estimates of direct effects are the coefficients directly linking variables to mobility. Indirect estimates are the sum of the interactions between variables in the other pathways (for example, in column 2 based on Figure 1 the indirect effect of family on social mobility 0.06 = (0.21*0.19) + (0.1*0.11) + (0.21*0.21*0.11). Figure 1 shows pathways when adult-bridging capital is excluded. Pathways including adult-bridging are not shown but can be calculated from results reported in tables 3-6.

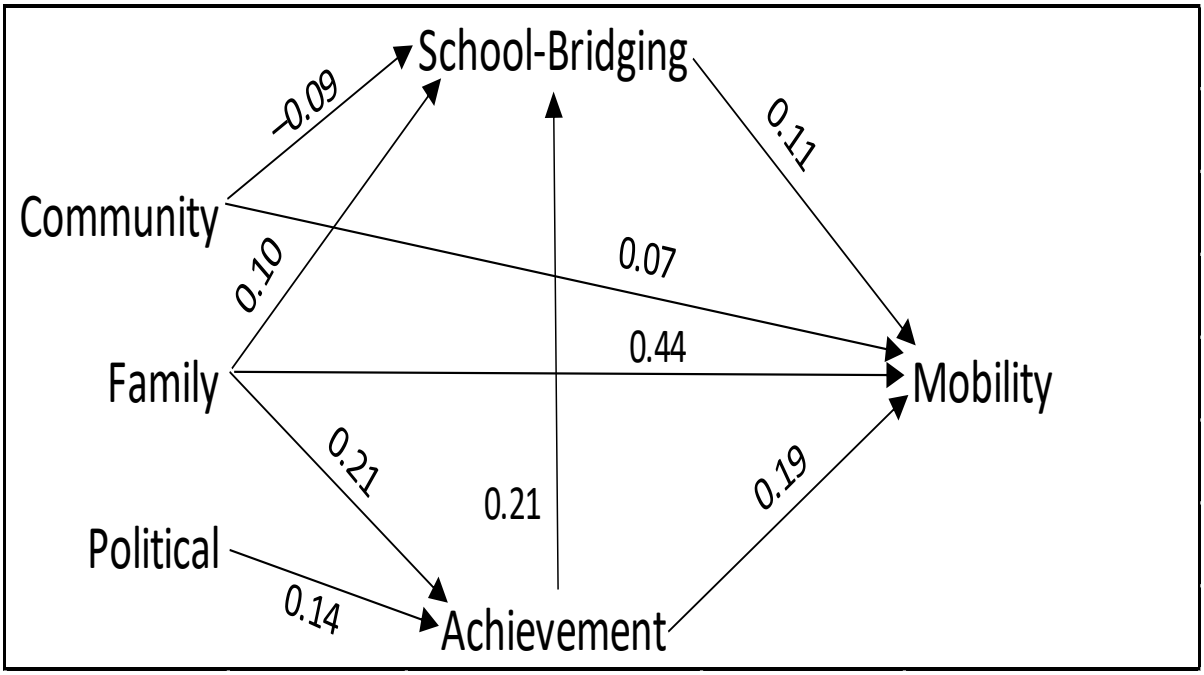

Figure 1. Total Social Capital and Achievement Relationships with Social Mobility (excluding adult-bridging)

Note: Estimations are taken from Tables 3, 4, 5, and 6. Insignificant estimates are ignored. Figure assumes that family, community, and political capital are independent of one another and none are caused by any other variable. It also assumes school-bridging is a function of achievement, with school-bridging forming one of the links to mobility.

Appendix

Table A1. Definitions of variables used in analysis

Variable	Definition
Family	This index uses two county-level measures from the 1983 City County Data Book (ISCPR #8256): the percent of households headed by a woman and the percent of families with a married couple. We also data from the 1982 National Center for Health Statistics Natality data from the NBER (https://www.nber.org/research/data/vital-statistics-natality-birth-data) on the percent of children born to married mothers. We use the first principal component of these three indicators.
Community	This variable is constructed using earlier available years but similar variables as the county-level community health subindex from the Joint Economic Commission. We use the first principal component of the following indicators: county-level measure of religious bodies from Churches and Church Membership in the United States, 1990; county-level measure counts of non-profits from the Urban Institutes 1990 IRS Statistics of Income Division Exempt Organizations File.
Political	This variable is constructed using earlier available years but similar variables as the county-level institutional health subindex from the Joint Economic Commission. We use the first principal component of the following indicators: county-level average (over 1988, 1992, and 1996) of votes in the presidential election per citizen age 18+ (except for Alaska; Alaska's is the state-level average) and the mailback response rate for the 1990 Census
School-bridging	"Childhood economic connectedness: two times the share of high parental-SES friends among low-parental-SES individuals averaged over all low-parental-SES individuals in the county, calculated using only individuals' high school friends." (Chetty et al., 2022, Codebook p. 4). This variable is child_ec_county from the publicly available dataset furnished by Chetty et al., (2022).
Adult bridging	Baseline definition of economic connectedness: two times the share of high-SES friends among low-SES individuals, averaged over all low-SES individuals in the county. (Chetty et al., 2022, Codebook pg. 3). This variable is ec_county from the publicly available dataset furnished by Chetty et al. (2022).
Relative social mobility	"Mean income percentile in adulthood of a child born to parents at or below the 25th percentile of the income distribution, from Chetty et al. (2018)." This variable is kfr_pooled_pooled_p25 from the publicly available dataset furnished by Chetty et al. (2022).
Mean achievement	County level averages of student math achievement are based on the Stanford Education Data Archive 4.1 for grades 3-8, for years 2009-2018.

Table A2: Predictors of Social Mobility: Weighted Estimates

	(1)	(2)	(3)	(4)	(5)
Variables	Social mobility				
Adult-bridging	0.485***	0.257***	0.318***		
	(0.052)	(0.039)	(0.047)		
Mean achievement			0.187***	0.352***	0.313***
			(0.049)	(0.064)	(0.063)
Family			0.312***	0.264**	0.205*
			(0.089)	(0.109)	(0.120)
Community			-0.027	-0.026	0.012
			(0.042)	(0.037)	(0.041)
Political			-0.080*	-0.082**	-0.017
			(0.045)	(0.037)	(0.041)
School-bridging			-0.225***	-0.115*	-0.029
			(0.060)	(0.068)	(0.067)
Racial segregation	0.114*	0.013	0.031	-0.014	-0.004
	(0.089)	(0.049)	(0.058)	(0.053)	(0.053)
Percent single parents	-0.413***	-0.495***			
	(0.064)	(0.064)			
Third grade math scores	-0.142***	0.062			
	(0.044)	(0.062)			
Median household income	0.004	-0.094	0.147**	0.148*	0.249***
	(0.052)	(0.056)	(0.072)	(0.078)	(0.081)
Percent black	-0.305***	0.031	-0.102	-0.101	-0.141*
	(0.059)	(0.051)	(0.074)	(0.082)	(0.080)
Gini coefficient	0.110	0.038	0.022	-0.037	-0.027
	(0.072)	(0.057)	(0.062)	(0.075)	(0.084)
Include state fixed effects?	no	yes	yes	yes	yes
Clustered?	cz	state	state	state	state
all or disadvantaged?			all	all	ECD
R-squared	0.694	0.849	0.832	0.815	0.818

Note: See Tables 1 and A1. Models in this table are identical to those in Table 3 but all models included the weights used in Model 1, which is identical to Model 1 in Table 3. cz = commuting zone. Observations are weighted by the population under the median income. *** p<0.01, ** p<0.05, * p<0.1. N= 1,333.

Table A3: Controlling for other measures of student achievement and other predictors of social mobility

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Social mobility					
Mean achievement	0.160***	0.148***	0.150***	0.153***	0.170***	0.130***
	(0.051)	(0.040)	(0.049)	(0.038)	(0.042)	(0.035)
Family	0.422***	0.397***	0.429***	0.412***	0.453***	0.442***
	(0.056)	(0.054)	(0.060)	(0.059)	(0.064)	(0.065)
Community	0.075**	0.093**	0.060**	0.072**	0.047	0.057*
	(0.034)	(0.035)	(0.030)	(0.029)	(0.029)	(0.030)
Political	0.024	0.040	0.038	0.051	0.057	0.072**
	(0.030)	(0.030)	(0.031)	(0.032)	(0.035)	(0.035)
School-bridging	0.101**	0.152***	0.141***	0.183***	0.103**	0.152***
	(0.047)	(0.039)	(0.045)	(0.042)	(0.048)	(0.045)
Racial segregation	0.001	0.011	0.001	0.008	-0.004	0.000
	(0.024)	(0.025)	(0.026)	(0.027)	(0.026)	(0.027)
Median household income	-0.059	-0.014	-0.060	-0.023	-0.096*	-0.051
	(0.049)	(0.051)	(0.058)	(0.056)	(0.051)	(0.057)
Percent black	0.109	0.092	0.091	0.080	0.138**	0.124*
	(0.067)	(0.060)	(0.069)	(0.065)	(0.067)	(0.065)
Gini coefficient	-0.049	-0.032	-0.046	-0.033	-0.053	-0.042
	(0.041)	(0.039)	(0.043)	(0.040)	(0.044)	(0.044)
Subject and year	Reading; all		Math 2009		Math 2018	
All or disadvantaged?	all	ECD	all	ECD	all	ECD
Observations	1,333	1,333	1,261	1,261	1,193	1,193
R-squared	0.815	0.817	0.812	0.815	0.829	0.827

Note: See Appendix Table 1. RLA: Reading & Language Arts ECD: Economically disadvantaged *** p<0.01, ** p<0.05, * p<0.1. Observations are unweighted. Specifications include state fixed effects with standard errors clustered by state. ECD: economically disadvantaged students (i.e., those eligible for free- or reduced-price lunch).

Table A4: Predictors of social mobility with larger sample

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Social mobility					
Adult-bridging	0.536***	0.611***	0.317***	0.270***		
	(0.050)	(0.028)	(0.024)	(0.031)		
Mean achievement				0.015	0.085*	0.093**
				(0.035)	(0.044)	(0.039)
Family				0.341***	0.373***	0.356***
				(0.042)	(0.049)	(0.049)
Community (JEC)				0.196***	0.243***	0.246***
				(0.033)	(0.037)	(0.038)
Political (JEC)				0.020	0.051	0.054
				(0.031)	(0.036)	(0.036)
School-bridging				0.047	0.148***	0.165***
				(0.046)	(0.042)	(0.036)
Percent single parents	-0.344***	-0.297***	-0.430***			
	(0.080)	(0.028)	(0.041)			
Third grade math scores	-0.079	-0.060***	0.003			
	(0.065)	(0.021)	(0.025)			
Median household income	-0.069	-0.278***	-0.215***	-0.095*	-0.082	-0.060
	(0.050)	(0.029)	(0.031)	(0.048)	(0.052)	(0.056)
Percent black	-0.244***	-0.045*	0.088*	0.040	0.044	0.037
	(0.048)	(0.024)	(0.049)	(0.051)	(0.056)	(0.053)
Gini coefficient	0.123*	-0.116***	-0.033	-0.065***	-0.093***	-0.088***
	(0.069)	(0.023)	(0.022)	(0.018)	(0.023)	(0.022)
State fixed effects?	no	no	yes	yes	yes	yes
Weighted?	yes	no	no	no	no	no
All or disadvantaged?				all	all	ECD
R-squared	0.615	0.667	0.843	0.838	0.825	0.827

Note: See Tables 1 and A1. In Column (1), observations are weighted by the population under the median income. In columns (2)-(6), observations are unweighted. In columns (1) and (2), standard errors are clustered by commuting zone. In the remaining columns, standard errors are clustered by state. *** p<0.01, ** p<0.05, * p<0.1. N= 2,625.

Table A5: Predictors of Social Mobility (with and without State Fixed Effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Social mobility							
Mean achievement	0.050	0.055	0.188***	0.174***	-0.061	-0.020	0.082**	0.113***
	(0.039)	(0.037)	(0.048)	(0.041)	(0.067)	(0.058)	(0.035)	(0.031)
Family	0.314***	0.303***	0.440***	0.416***	0.309***	0.303***	0.412***	0.392***
	(0.054)	(0.056)	(0.057)	(0.054)	(0.079)	(0.080)	(0.054)	(0.051)
Community	-0.007	-0.004	0.065**	0.079***	-0.021	-0.029	0.064**	0.070**
	(0.026)	(0.026)	(0.028)	(0.029)	(0.036)	(0.036)	(0.029)	(0.030)
Political	0.197***	0.202***	0.031	0.049	0.115**	0.111**	0.028	0.036
	(0.033)	(0.033)	(0.032)	(0.032)	(0.054)	(0.055)	(0.032)	(0.031)
School-bridging	0.432***	0.443***	0.113**	0.167***				
	(0.048)	(0.046)	(0.046)	(0.041)				
Adult-bridging					0.564***	0.546***	0.295***	0.304***
					(0.070)	(0.067)	(0.039)	(0.035)
Racial segregation	0.052**	0.055**	-0.005	0.005	0.097***	0.096***	0.036	0.042
	(0.023)	(0.023)	(0.025)	(0.025)	(0.031)	(0.031)	(0.027)	(0.028)
Median household income	-0.265***	-0.252***	-0.063	-0.015	-0.127*	-0.148**	-0.070	-0.036
	(0.066)	(0.066)	(0.055)	(0.057)	(0.066)	(0.061)	(0.045)	(0.044)
Percent black	-0.134***	-0.137***	0.119*	0.106*	-0.071	-0.069	0.099	0.102*
	(0.043)	(0.043)	(0.066)	(0.062)	(0.069)	(0.070)	(0.060)	(0.058)
Gini coefficient	-0.109***	-0.105***	-0.044	-0.028	-0.042	-0.045	-0.027	-0.017
	(0.031)	(0.031)	(0.041)	(0.039)	(0.056)	(0.056)	(0.037)	(0.035)
Clustered se?	cz	cz	state	state	state	state	state	state
State fixed effects?	no	no	yes	yes	no	no	yes	yes
All or disadvantaged?	all	ECD	all	ECD	all	ECD	all	ECD
R-squared	0.613	0.614	0.816	0.817	0.656	0.655	0.830	0.833

Note: See Tables 1 and A1. Observations are unweighted. Columns (3) and (4) are replicated from Table 3, columns (5) and (6). *** p<0.01, ** p<0.05, * p<0.1. N= 1,333.

Table A6: Does adult bridging predict other social capital measures?

	(1)	(2)	(3)	(4)	(5)
	family	SEDA math all	Community	Political	school bridging
Adult-bridging	0.153***	0.451***	-0.037	0.101**	0.470***
	(0.033)	(0.048)	(0.054)	(0.050)	(0.042)
Family		0.109**	-0.018	0.028	0.042
		(0.045)	(0.083)	(0.053)	(0.050)
Racial segregation	-0.090***	0.042**	0.010	0.044*	-0.011
	(0.020)	(0.018)	(0.024)	(0.025)	(0.024)
Median household income	-0.030	0.253***	-0.397***	0.175***	0.494***
	(0.028)	(0.031)	(0.050)	(0.039)	(0.033)
Percent black	-0.659***	-0.260***	-0.118	-0.073	0.078*
	(0.037)	(0.037)	(0.080)	(0.052)	(0.039)
Gini coefficient	-0.324***	0.073**	-0.080	-0.119***	0.066**
	(0.034)	(0.029)	(0.066)	(0.042)	(0.031)
R-squared	0.836	0.799	0.419	0.668	0.842

Note: See Tables 1 and A1. All columns include state fixed effects. Standard errors are clustered by state. *** p<0.01, ** p<0.05, * p<0.1. N= 1,333.