Geography of intergenerational mobility and child development

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Recent research by Chetty and colleagues finds that children's chances of upward mobility are affected by the communities in which they grow up [Chetty R, Hendren N (2016) Working paper 23002]. However, the developmental pathways through which communities of origin translate into future economic gain are not well understood. In this paper we examine the association between Chetty and Hendren's county-level measure of intergenerational mobility and children's cognitive and behavioral development. Focusing on children from low-income families, we find that growing up in a county with high upward mobility is associated with fewer externalizing behavioral problems by age 3 years and with substantial gains in cognitive test scores between ages 3 and 9 years. Growing up in a county with 1 SD better intergenerational mobility accounts for ∼20% of the gap in developmental outcomes between children from low- and high-income families. Collectively, our findings suggest that the developmental processes through which residential contexts promote upward mobility begin early in childhood and involve the enrichment of both cognitive and social-emotional development.

intergenerational mobility | child development | poverty | inequality

In a recent series of papers, Chetty et al. (1–3) show that the economic prospects of children from low-income families depend on where they grow up. Analyzing tax records of more than five million families, the authors estimate the causal effect of growing up in each US county on the future income of children from families at different points on the income distribution (3). For example, a child from a low-income family (the 25th percentile of the household income distribution) who grows up in Fairfax County, VA is expected to earn around 12% more in adulthood (at age 26 y) than the same child would have earned had he or she grown up in the average US county. Variation in upward mobility across counties is substantial; the authors estimate that growing up in a county with 1 SD better intergenerational mobility (IM) increases the adult income of children from low-income families by around 10%.

The "birth lottery" of place documented by Chetty and colleagues (4–8) contributes to a growing consensus among researchers and policy makers that economic opportunities of disadvantaged children are shaped by the residential contexts in which they grow up. However, several questions of high importance to researchers and policy makers remain. First, the work conducted by Chetty et al. does not tell us why growing up in one county expands opportunity, whereas growing up in another does not. Comparing levels of IM with other county characteristics, Chetty and Hendren (3) find that county IM is associated with better-performing school districts and lower levels of income inequality, residential segregation, crime, and single-parent households. Although not necessarily causal, these statistical correlates provide a useful portrait of the ecological conditions experienced by disadvantaged children most likely to achieve future economic success.

Second, the Chetty et al. papers do not tell us how growing up in a high-IM county affects the developmental trajectories of economically disadvantaged children. By definition, Chetty and Hendren's county measure (3) necessities one or more intervening developmental pathways through which past residence translates into future economic gain. A variety of developmental capacities have been shown to be associated with future economic success, including cognitive skills (e.g., scores on academic achievement tests) and noncognitively skills, that is, what psychologists call "social–emotional skills," with a particular focus on self-regulation (9, 10). Socioeconomic inequities in the early acquisition of these competencies are widely believed to reproduce labor market inequalities across generations, motivating policies and programs to target vulnerable children early, especially during the preschool years (11, 12).

Based on child development theory and research, we hypothesize that children who grow up in counties characterized by higher levels of IM will exhibit higher cognitive and social–emotional skills than children who grow up in counties characterized by lower levels of IM. Additionally, we expect any links between county IM and child development to be more salient for children from low-income families than for children from high-income families. In this paper, we test these hypotheses by merging Chetty and Hendren's county-level data on IM (3) with individual-level data from a population-based birth cohort study of children born in large US cities. First, we document inequalities in children's development by family income during middle childhood (age 9 y). Second, we estimate associations between county IM and children's developmental outcomes (at age 9 y and changes between ages 3 and 9 y). Collectively, we provide evidence that growing up in a county favorable to upward mobility affects the developmental trajectories of economically disadvantaged children in ways that have important implications for current policy and future research.

Significance

Using data from an urban birth cohort study, we show that children from low-income families who grow up in counties that produce high levels of upward mobility, as recently estimated by Chetty and Hendren, exhibit fewer externalizing behaviors by age 3 years and show substantial gains in cognitive test scores between ages 3 and 9 years. These associations are robust to controls for family characteristics, including parental intelligence, impulsivity, and mental health. This paper identifies developmental pathways through which intergenerational mobility of place, measured at the county level, shapes the economic prospects of children from low-income families.

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Results

The current study is based on data from the Fragile Families and Child Wellbeing Study (FFCWS), a population-based birth-cohort study of children born in 20 large US cities between 1998 and 2000. Our analyses include 4,226 children from 562 US counties whose developmental outcomes were assessed at approximately ages 3, 5, and 9 y. Based on children's household income at birth, we divide the sample into low- and high-income subsamples, stratified by the median US household income in 1999 ($41,994). Children from low-income families have a mean household income of $18,282; children from high-income families have a mean household income of $73,762. Refer to Table S1 for a complete description of the two income subsamples.

Income Disparities in Children's Development During Middle Childhood. Table 1 compares the cognitive and behavioral outcomes of children from low- and high-income families at age 9 y. For ease of interpretation, all outcomes are standardized to a mean of 0 and SD of 1 using FFCWS sampling weights, producing age-adjusted scores relative to the cohort of all children born in the 20 sample cities. Refer to *Materials and Methods* for a complete description of the sample and all outcome measures.

Three cognitive tests were administered in children's homes: the Peabody Picture Vocabulary Test (PPVT) (13), which assesses receptive vocabulary skills; the Woodcock–Johnson III Passage Comprehension Test (Subset 9) (WJ-09) (14), which measures reading comprehension; and the Woodcock–Johnson III Applied Problems Test (Subset 10) (WJ-10), which evaluates competency in mathematics (14). Large differences in test scores are evident between income subgroups by age 9 y. Specifically, children from low-income families score 0.73 SD lower on the vocabulary test than children from high-income families. Mean differences in reading and mathematics tests scores are also substantial (0.56 and 0.57 SD, respectively).

Parents and teachers assessed children's externalizing (aggressive, destructive, and rule-breaking) behaviors using the Child Behavior Check List (CBCL) (15) and Social Skills Rating Scale (SSRS) (16). Differences in externalizing behaviors by family income are considerable but are less pronounced than differences in cognitive test scores. Based on parent reports, children from low-income families exhibit 0.26 SD higher levels of externalizing behaviors than children from high-income families. Mean differences by family income are notably larger when children's behaviors are assessed by teachers (0.41 SD).

County IM and Children's Development During Middle Childhood. We estimate associations between county IM and children's developmental outcomes during middle childhood (age 9 y). For each income subgroup, we regress outcomes on children's average annual exposure to county IM from birth to age 9 y using ordinary least squares (OLS) regression. Models adjust SEs for the clustering of families within counties (at birth) and control for family socio-demographic characteristics (measured at birth or child age 1 y) and the mother's intelligence, impulsivity, and depression (measured at child age 3 y). Data on county IM were obtained from Chetty and Hendren's estimates of the causal effect of counties on adult household income for children from low-income families (3). For ease of interpretation, county IM is standardized to a mean of 0 and SD of 1 across all US counties, weighted by county population. For full model results, refer to Tables S2 and S3.

As shown in Fig. 1, among children from low-income families, a 1 SD increase in county IM is associated with a 0.14 SD increase in vocabulary test scores (95% CI 0.092, 0.189) and a 0.11 SD increase in reading test scores (95% CIs 0.027, 0.200) at age 9 y. These changes represent around 20% of the 0.73 and 0.56 SD differences in test scores between children from low- and high-income families. County IM is weakly and inconsistently associated with vocabulary and reading test scores of children from high-income families. In contrast, county IM is predictive of mathematics test scores for both income subgroups; a 1 SD increase in county IM is associated with a 0.07 SD increase in mathematics test scores for children from both low- and high-income families (95% CI 0.002, 0.137 when estimated on the full sample).

County IM is negatively correlated with the externalizing behaviors of children from low-income families. Based on teacher assessments of children's behavior, a 1 SD increase in county IM is associated with 0.08 SD lower levels of externalizing behaviors (95% CI −0.154, −0.011). As with vocabulary and reading test scores, this change represents about 20% of the 0.41 SD difference between children from low- and high-income families. Based on parent assessments, the association between county IM and children's externalizing behaviors is consistent in direction but smaller in magnitude and not significantly different from zero (95% CI −0.092, 0.020). Associations between county IM and the externalizing behaviors of children from high-income families are weak and inconsistent (β = 0.004, 95% CI −0.061, 0.069, and β = −0.027, 95% CI −0.079, 0.026).

County IM and Children's Developmental Trajectories. We examine the timing and trajectory of associations between county IM and the developmental outcomes of children from low-income families. Table 2 shows results from hierarchical linear models (HLM) that predict vocabulary test scores and parent-rated externalizing behaviors measured repeatedly (up to three times per child) between ages 3 and 9 y. In model 1, county IM represents the average county effect across all assessments. Model 2 interacts county IM with child age (mean centered at age 3 y); thus, the county IM coefficient represents the county effect at age 3 y, and the county IM × child age coefficient represents the annual change in the county IM effect thereafter. Refer to *Materials and Methods* for further description of HLM models and to Table S4 for full model results.

Results show that trajectories of children's vocabulary test scores depend on their past exposure to county IM. County IM is weakly associated with test scores when children's cognitive ability is first assessed at age 3 y (β = 0.027, 95% CI −0.031, 0.084), but over time this association increases by a rate of 0.022 SD/y (95% CI 0.0126, 0.030). For children's externalizing behaviors, the estimated effect of county IM emerges at age 3 y and remains constant. Across all assessments between ages 3 and 9 y, a 1 SD increase in county IM is associated with a 0.05 SD reduction in externalizing behaviors (95% CI −0.102, −0.004). Similar to other developmental outcomes, the magnitude of this association accounts for about 20% of the 0.26 SD difference between children from low- and high-income families at age 9 y.

To illustrate these findings, Fig. 2 plots children's developmental trajectories obtained from model estimates shown in Table 2. We show trajectories for children from low-income families who grow up in counties with low IM (1 SD below the national mean; dotted

Table 1. Children's developmental outcomes at age 9 y by household income

	Mean z-score (SD)		
Outcome	Low-income	High-income	Difference
Cognitive test scores			
Vocabulary (PPVT)	−0.30 (0.85)	0.44 (0.94)	−0.73
Reading (WJ-9)	−0.23 (0.96)	0.33 (0.92)	−0.56
Mathematics (WJ-10)	−0.27 (0.92)	0.30 (0.91)	−0.57
Externalizing behaviors			
Parent-rated (CBCL)	0.12 (1.10)	−0.14 (0.81)	0.26
Teacher-rated (SSRS)	0.20 (1.12)	−0.22 (0.77)	0.41

Children's developmental outcomes are presented as z-scores relative to the cohort of all children born in the 20 sample cities between 1998 and 2000.

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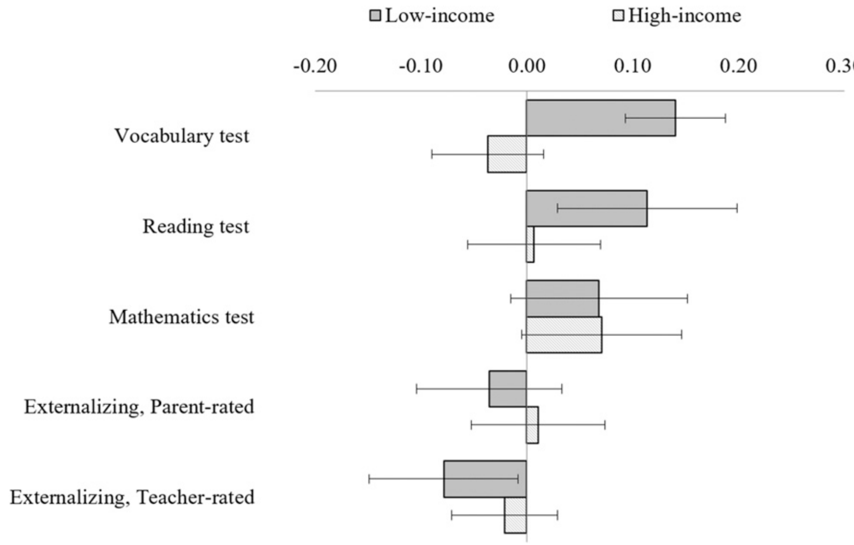

Fig. 1. Associations between county IM and children's developmental outcomes at age 9 y by household income. Bars represent the SD change in children's developmental outcomes at age 9 y for a 1 SD increase in county IM, conditional on family characteristics. Error bars indicate 95% CIs of the estimated associations. SEs are adjusted for clustering of children within counties at birth. For full model results, including coefficients of control variables, refer to Tables S2 and S3.

black line) and high IM (1 SD above the national mean; solid black line), controlling for family characteristics. To highlight gaps in developmental trajectories by income, we also plot the average scores of children from high-income families (mean county IM within the analytic sample; dashed gray line). Fig. 2*A* shows that economically disadvantaged children from both low- and high-IM counties score around 0.20 of a SD below average on vocabulary tests at age 3 y. However, children from low-income families who grow up in high-IM counties experience gains in test scores relative to their economically disadvantaged peers, approaching the average national score by age 9 y. In contrast, the test scores of children from low-income families who grow up in low-IM counties decline to more than a third of a SD below average by age 9 y. Fig. 2*B* shows developmental trajectories of children's externalizing behaviors. Differences by county IM emerge at age 3 y for children from low-income families and persist throughout middle childhood. By age 9 y, economically disadvantaged children from high-IM counties approach the average national score on the externalizing behaviors scale.

Alternative Model Specifications. Analyses presented thus far include controls for family sociodemographic characteristics measured at birth (or at the year 1 follow-up interview) and maternal characteristics (intelligence, impulsivity, and depression) measured at the year 3 follow-up interview. Control variables are intended to hold constant family characteristics around the time of birth (i.e., to compare children from different counties born to similar families). Maternal characteristics measured at year 3, however, may be affected by exposure to county characteristics between birth and year 3, biasing county effects downward. To test this possibility, we exclude maternal characteristics measured at year 3 and find that our results are nearly identical to those presented in Fig. 1 and Table 2. Net of socio-demographic characteristics, county IM is weakly correlated with maternal intelligence, impulsivity, and mental health measured at year 3.

Family socio-demographic characteristics measured at birth may also be affected by county characteristics before the child's birth (e.g., the quality and accessibility of community colleges may impact parents' educational attainment). By controlling for these characteristics, our models exclude potential "multigenerational" neighborhood effects (17). To examine these potential pathways, we conduct supplemental analyses predicting parent-rated externalizing behaviors and vocabulary test scores, controlling only for time-invariant characteristics (i.e., race/ethnicity and immigrant status). These models produce estimates of county IM effects that are around 25–45% larger in magnitude (depending on outcome and model specification) than those presented in Fig. 1 and Table 2. Interestingly, this range approximates the share of county IM variation that Chetty and Hendren attribute to systematic differences in the characteristics of families living in each county (around one third) (3). Regardless of which control variables are included, the association of county IM with children's vocabulary test scores accumulates over time, and the association with children's externalizing behaviors is constant over time. Full model results of the alternative model specifications are shown in Table S5.

Table 2. HLM regressions of developmental outcomes of children from low-income families between ages 3 and 9 y

Variable	Model 1	Model 2
Vocabulary test score		
County IM, z-score	0.100 (0.025)	0.027 (0.029)
Child age, y, centered at 3 y	−0.008 (0.003)	0.008 (0.005)
County IM × child age		0.022 (0.005)
Externalizing behaviors, parent rated		
County IM, z-score	−0.053 (0.025)	−0.053 (0.029)
Child age, y, centered at 3 y	−0.008 (0.004)	−0.008 (0.006)
County IM × child age		0.000 (0.005)

SEs of coefficients are presented in parenthesis. Children's developmental outcomes are represented as z-scores relative to the cohort of all children born between 1998 and 2000 in the 20 sample cities. County IM is computed as children's average annual county IM from birth to age of assessment. For full model results, including variance components, refer to Table S4.

Alternative Measures of County IM. The analyses presented thus far use Chetty and Hendren's measure of IM as estimated by the causal effects of counties on household income (at age 26 y) for children from low-income families (3). To test the sensitivity our findings to this particular measure, we replicate analyses using two alternative measures of county IM, also developed by Chetty and Hendren: the causal effect of counties on individual income (at age 26 y) and on college enrollment (between ages 18 and 23 y) for children from low-income families (3). Results using county IM measures based on individual income and college enrollment are similar to those

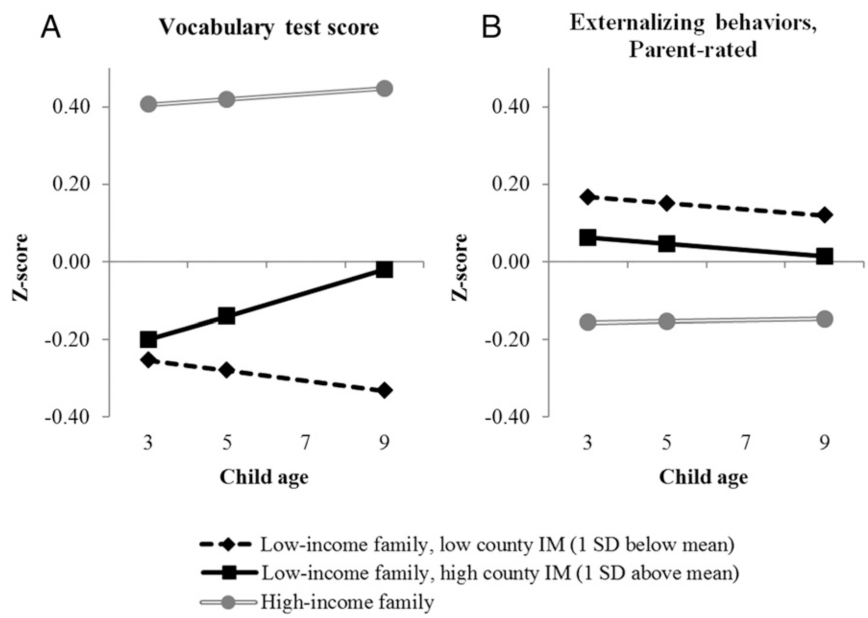

Fig. 2. Children's developmental trajectories between ages 3 and 9 y by household income and county IM. Predicted scores are obtained from model estimates shown in Table 2. (*A*) Predicted scores for children's vocabulary test scores. (*B*) Predicted scores for children's externalizing behaviors.

shown in Fig. 1 and Table 2. Full model results using the alternative county measures are shown in Table S6.

Alternative Measures of Children's Developmental Outcomes. Finally, we repeat our analyses using alternative indicators of children's behavior: (*i*) children's attention problems, as rated by parents at the year 3, 5, and 9 interviews, using the CBCL (15); (*ii*) children's self-control, as rated by teachers at the year 9 interview, using the SSRS (16); and (*iii*) children's oppositional behaviors, as rated by teachers at the year 9 interview, using the Conner's Teacher Rating Scale (18). Results from models predicting children's attention problems closely resemble those for externalizing behaviors. In addition, the estimated effects of county IM on teacher reports of children's self-control-social skills and oppositional behaviors are similar in absolute magnitude to the estimated effects on teacher reports of children's externalizing behaviors. Full model results predicting the alternative developmental outcomes are shown in Table S7.

Discussion

This study shows that Chetty and Hendren's county-level measure of IM (3) is associated with lower levels of externalizing behaviors and higher test scores for children from low-income families. Associations are robust to controls for parents' race/ethnicity, education, intelligence, impulsivity, and mental health—family characteristics that were not available in the tax data used by Chetty and Hendren to construct their measure of IM. We estimate that growing up in a county with 1 SD higher IM reduces the gap between advantaged and disadvantaged children's cognitive and behavioral outcomes by around 20%. Broadly speaking, our findings suggest that the developmental processes through which place promotes (or inhibits) upward mobility (*i*) begin in childhood and (*ii*) depend on the extent to which communities enrich the cognitive and social–emotional skills of children from low-income families.

More specifically, we find that children from low-income families who grow up in higher-IM counties experience steady gains in cognitive test scores between ages 3 and 9 y relative to those who grow up in lower-IM countries. These gains, which first appear around age 5 y and accumulate over time, are consistent with the argument that high-quality schools account for some of the advantage associated with growing up in a high-mobility county.

The pattern for externalizing behavior is somewhat different. For this outcome, the benefits associated with growing up a high-IM county appear by age 3 y and do not grow (or decline) over time. These two findings—early appearance and the lack of cumulate effects—are less consistent with a causal story and more consistent with a selection story than the findings for cognitive development. To explain this pattern, a causal story would have to argue that the benefits associated with living in a high-IM county are age-specific (0–3 y) and durable. Examples of county-level factors that might explain this pattern would include programs that affect children directly, such as access to high-quality health care or preschool, or programs that affect children indirectly by reducing parents' economic insecurity (e.g., Earned Income Tax Credit, housing). Finally, as discussed in *Materials and Methods*, externalizing behavior is more likely to be measured with error, which may affect our estimates of county IM effects.

For children from high-income families, IM is weakly associated with most developmental outcomes, providing evidence that Chetty and Hendren's county measure (3) captures conditions favorable to economically disadvantaged children rather than more generally to children overall. Importantly, conditions favorable for disadvantaged children's development do not appear to come at the expense of advantaged children's development. For children from high-income families, the associations between IM and language acquisition and externalizing behavior are close to zero, but for mathematics they are similar to estimates for children from low-income families.

In sum, the primary contribution of the current study is to document possible developmental pathways through which Chetty and Hendren's county-level measure of IM (3) operates; namely, by increasing children's cognitive and social emotional development. We do not identify the specific contexts that make one county more or less favorable for economically disadvantaged children. Instead, we conceptualize Chetty and Hendren's's measure of county IM as a proxy for a constellation of unobserved ecological conditions that work together to promote (or inhibit) upward mobility. As reported by Chetty and Hendren and discussed previously, this proxy measure is correlated with better-performing school districts, less economic inequality and residential segregation, lower rates of crime, and fewer single-parent households. In addition, sociological research points to spatial

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variation in institutional resources (e.g., quality childcare centers, health facilities), collective socialization (e.g., supportive social relationships and norms), and physical hazards (e.g., poor housing and pollutants) as critical mechanisms through which place affects child development and adult economic opportunity (19, 20). We assume that one or more of these unobserved residential contexts (correlated with county IM) contribute directly to the associations documented in this study. More likely, however, these favorable ecological conditions interact with each other and with other unidentified contexts (also correlated with county IM) to support child development and upward mobility. Therefore, we recommend that future research examine interactions among multiple residential contexts, focusing on community institutions that serve children directly (e.g., schools) and on community environments that affect children indirectly by influencing those who care for them (e.g., labor markets).

We conclude by acknowledging two important limitations of this study. First, the nonexperimental design limits causal interpretation. The large set of family control variables, including parents' intelligence, impulsivity, and mental health, is likely to minimize much of the bias caused by family self-selection into counties. However, we do not present or interpret our estimates as unbiased causal effects. In particular, we note that the estimated county effects on children's externalizing behaviors are relatively small in magnitude, emerge early in life, and persist but do not accumulate over time. Although not inconsistent with a causal effect, the nature of these associations raises the possibility of a spurious association. Second, the children we studied were born and grew up in large urban areas. Our focus on economically disadvantaged children growing up in urban environments is consistent with much of the sociological literature that links residential context and social stratification (20–22). However, we caution against generalizing findings to children from suburban or rural environments.

Materials and Methods

FFCWS. The FFCWS study protocol was approved by the institutional review board of Princeton University and informed consent was obtained in line with the study protocol. Data on children were obtained from the FFCWS, a stratified multistage probability sample of children born in large US cities (population 200,000+) between 1998 and 2000 (23). Children's parents were first interviewed in hospitals when focal children were born; follow-up surveys and assessments of children and their families occurred ∼1, 3, 5, and 9 y later. The FFCWS oversampled children born to unmarried parents (approximately three quarters of the children's parents were unmarried), resulting in a disproportionately large sample of economically disadvantaged children. The low-income sample of this study consists of 7,434 repeated assessments of 3,235 children whose parents' reports of their annual household income at birth and 1 y later averaged below $41,994 (the median national household income in 1999); the high-income sample consists of 2,295 repeated assessments of 991 children whose parents' reported household incomes averaged above this threshold. The complete sample includes children born in 20 cities and 174 counties. Because of residential mobility, data on 562 counties are incorporated into measures of children's exposure to county characteristics between birth and age 9 y. Not all outcomes were assessed for all children at each wave; therefore, sample sizes within each income subsample vary across waves of assessments and developmental outcomes. Refer to Table S8 for sample sizes by wave and outcome. In order to protect the confidentiality of survey respondents, data on respondents' county characteristics are not publicly available. Information about accessing county and neighborhood characteristics through the FFCWS contract data agreement process can be found here: http://fragilefamilies.princeton.edu/restricted.

Measures of County IM. Data on county IM were downloaded from the Equality of Opportunity Project website (24). These data estimate the causal effects of county residence on IM expressed as the percentage change in household income at age 26 y for children from low-income families (parents at the 25th percentile of the national income distribution) from spending one more year of childhood in a given county compared with the national mean. We transformed these county estimates to z-scores using the population-weighted mean and SD of all US counties and merged z-scores to children's county residence at each year from birth to age 9 y (assuming any change in county residence occurred at the midpoint between waves). Then we constructed three measures of children's average annual exposure to county IM: from birth to age 3 y, 5 y, and 9 y, respectively.

Measures of Child Development. Vocabulary test scores and parent-rated externalizing behaviors were assessed at three follow-up waves: between ages 2 and 4 y (median age 3 y), between ages 4 and 6 y (median age 5 y), and between ages 8 and 11 y (median age 9 y). The PPVT (13) was used to measure children's receptive vocabulary for standard American English. Children's externalizing behaviors were assessed by parents using the CBCL (15). Parent responses to survey items (0 = not true, 1 = somewhat true, 2 = very true) were summed to create composite scores based on 21 survey items from the destructive/aggressive subscale at age 3 y ($\alpha = 0.85$) and based on 25 survey items from the rule-breaking and aggressive subscales at age 5 y and 9 y ($\alpha = 0.85$, and 0.89, respectively).

Our measures of cognitive and social–emotional skills differ in two noteworthy ways. First, social–emotional skills are likely to be measured with more error. Although cognitive skills are measured by an objective test, our measure of externalizing behavior is based on parents' reports of their children's behavior. Parents may evaluate their children's behavior relative to other children in their communities; such evaluations would underestimate differences between communities. Parents may also lack knowledge about their children's behavior in school, an important determinate of their future success. Second, vocabulary is a positive skill that is expected to increase over childhood, whereas externalizing behaviors are negative behaviors that are expected to decline between ages 3 and 9 y (25). The developmental trajectory for externalizing behaviors combined with the negative character of the measure may make it harder to discern the effect of living in a higher-IM country on children's development.

Additional developmental outcomes were assessed only when children were approximately age 9 y. Reading comprehension was measured using the WJ-09 achievement test, which involved children reading a short passage and accurately identifying missing words that were consistent with the context of the passage read (14). Competency in mathematics was measured using the WJ-10 achievement test, which involved children analyzing and solving mathematics problems (14). In addition, children's externalizing behaviors were assessed by their primary school teachers using the Externalizing Problems subscale of the SSRS (16) ($\alpha = 0.93$ and 0.95, respectively).

For comparability of coefficient estimates across outcomes, we transformed scores on all scales and cognitive tests to weighted z-scores. Sample means and SDs at each wave were estimated using FFCWS sampling (city) weights. All outcome measures represent the SD difference between the child's score and the average score of children born in the 20 FFCWS sample cities between 1998 and 2000. Refer to Table S8 for a complete description of all unstandardized developmental outcomes by wave.

Analyses. Associations between county IM and children's developmental outcomes at age 9 y (shown in Fig. 1) were estimated using OLS regression. Associations between county IM and children's development from age 3–9 y (shown in Fig. 2 and Table 2) were estimated using three-level HLM. All models control for the following variables: child sex and birth weight, household income, number of children in household, home ownership, welfare receipt, family structure, residential mobility, and the mother's age, immigrant status, education, race/ethnicity, intelligence, impulsivity, and depression. For further description of control variables, model specifications, and robustness checks, refer to *SI Text*.

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1. Chetty R, Hendren N, Kline P, Saez E (2014) Where is the land of opportunity? The geography of intergenerational mobility in the United States. *Q J Econ* 129:1553–1623.
2. Chetty R, Hendren N, Kline P, Saez E, Turner N (2014) Is the United States still a land of opportunity? Recent trends in intergenerational mobility. *Am Econ Rev* 104:141–147.
3. Chetty R, Hendren N (2016) The impacts of neighborhoods on intergenerational mobility II: County-level estimates. Working paper 23002 (National Bureau of Economic Research, Cambridge, MA). Available at http://www.nber.org/papers/w23002. Accessed July 1, 2017.
4. Massey DS (2013) Inheritance of poverty or inheritance of place? The emerging consensus on neighborhoods and stratification. *Contemp Sociol* 42:690–695.
5. Chetty R, Hendren N, Katz LF (2016) The effects of exposure to better neighborhoods on children: New evidence from the moving to opportunity experiment. *Am Econ Rev* 106:855–902.

6. Wolfers J (2015) Why the new research on mobility matters: An economist's view. *NY Times*, Available at https://www.nytimes.com/2015/05/05/upshot/why-the-new-research-on-mobility-matters-an-economists-view.html. Accessed June 1, 2015.
7. Chetty R (2015) *Place, Opportunity, and Social Mobility: What Now for Policy?* (Brookings Institution, Washington, DC), Available at https://www.brookings.edu/events/place-opportunity-and-social-mobility-what-now-for-policy/. Accessed June 1, 2015.
8. Rothwell J, Massey DS (2015) Geographic effects on intergenerational income mobility. *Econ Geogr* 91:83–106.
9. Sampson RJ (2016) The characterological imperative: On Heckman, Humphries, and Kautz 's the myth of achievement tests: The GED and the role of character. *J Econ Lit* 54:493–513.
10. Wodtke GT, Harding DJ, Elwert F (2016) Neighborhood effect heterogeneity by family income and developmental period. *AJS* 121:1168–1222.
11. Heckman BJ, Pinto R, Savelyev P (2013) Understanding the mechanisms through which an influential early childhood program boosted adult outcomes. *Am Econ Rev* 103:2052–2086.
12. Heckman JJ (2006) Skill formation and the economics of investing in disadvantaged children. *Science* 312:1900–1902.
13. Dunn LM, Dunn LM (1997) *PPVT-III: Peabody Picture Vocabulary Test* (American Guidance Service, Circle Pines, MN).
14. Woodcock RW, McGrew KS, Mather N (2001) *Woodcock-Johnson III Tests of Achievement* (Riverside Publishing, Itasca, IL).
15. Achenbach TM, Rescorla LA (2000) *Manual for the ASEBA Preschool Forms & Profiles* (University of Vermont, Research Center for Children, Youth, & Families, Burlington, VT).
16. Gresham FM, Elliott SN (2007) *Social Skills Rating System* (Pearson Publishing, Toronto).
17. Sharkey P, Elwert F (2011) The legacy of disadvantage: Multigenerational neighborhood effects on cognitive ability. *AJS* 116:1934–1981.
18. Conners K (2001) *Conners' Rating Scales-Revised: Technical Manual* (MultiHealth Systems, Toronto).
19. Sampson RJ, Morenoff JD, Gannon-Rowley T (2002) Assessing "neighborhood effects": Social processes and new directions in research. *Annu Rev Sociol* 28:443–478.
20. Sharkey P, Faber JW (2014) Where, when, why, and for whom do residential contexts matter? Moving away from the dichotomous understanding of neighborhood effects. *Annu Rev Sociol* 40:559–579.
21. Wilson WJ (1987) *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy* (Univ of Chicago Press, Chicago).
22. Galster GC (2012) The mechanism(s) of neighbourhood effects: Theory, evidence, and policy implications. *Neighbourhood Effects Research: New Perspectives*, eds Ham M, Manley D, Bailey N, Simpson L, Maclennan D (Springer, Dordrecht, The Netherlands), pp 23–56.
23. Reichman NE, Teitler JO, Garfinkel I, McLanahan SS (2001) Fragile familes: Sample and design. *Child Youth Serv Rev* 23:303–326.
24. Chetty R, Hendren N (2015) Online data table 2: Preferred estimates of causal place effects by county. *Data from Chettyand Hendren Causal Eff Mobil Estim Covariates by County, CZ Birth Cohort*, Available at equality-of-opportunity.org/index.php/data. Accessed May 20, 2006.
25. Miner JL, Clarke-Stewart KA (2008) Trajectories of externalizing behavior from age 2 to age 9: Relations with gender, temperament, ethnicity, parenting, and rater. *Dev Psychol* 44:771–786.
26. Wechsler D (1981) *Wechsler Adult Intelligence Scale – Revised (WAIS-R Manual)* (The Psychological Corporation, New York).
27. Dickman SJ (1990) Functional and dysfunctional impulsivity: Personality and cognitive correlates. *J Pers Soc Psychol* 58:95–102.
28. Kessler RC, Andrews G, Mroczek D, Ustun B, Wittchen H-U (1998) The World Health Organization Composite International Diagnostic Interview short-form (CIDI-SF). *Int J Methods Psychiatr Res* 7:171–185.
29. Royston P (2004) Multiple imputation of missing values. *Stata J* 4:227–241.