Is Zip Code Destiny?
Re-visiting Long-run Neighborhood Effects

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Introduction

- Children's incomes in adulthood vary remarkably by the local region where they grow up (Chetty et al. (2014)).
- Spatial variation in intergenerational mobility has been documented for the US and many other developed countries.
- What is the causal status of the link between neighborhood of residence and longrun economic well-being?
- To what extent do the differences in income mobility across geographical areas reflect causal effects of place (Chetty & Hendren (2018a,b); Chetty et al. (2020a,b); Chetty (2021))?
- This paper
  - documents life cycle heterogeneity in the neighborhood sorting
  - critically reviews the estimation procedures and underlying assumptions of the extant literature: causality or correlation?

Motivation

- Chetty & Hnedren (2018a) analyze data on families who moved across commuting zones (CZ) in the US and argue that neighborhoods shape various adulthood outcomes of children:
  - Adult incomes of children who moved converge to the adult incomes of children of permanent residents in the destination at a rate of 4% per year of exposure
- They interpret their results as *causal effects* of neighborhoods
- Chetty et al. (2020a) repeat the analysis at the Census tracts
- Replicated using data from other countries
- Chetty & Hendren (2018b): Causal effects of each county/CZ
- Chetty et al. (2020a) construct an "Opportunity Atlas"
- Touted as "zip code destiny" or "power of place"

Motivation- Cont'd

- Influence on the design of housing policies
- Relocation policies as a way to promote upward mobility
- Creating Moves to Opportunity Experiment (CMTO) in Seattle and King county (Bergman et al. (2019))
- Should we invest in families and local amenities, or whether should we relocate families across neighborhoods?

This Paper

- Replicates Chetty et al. (2018) using Danish registers
- Investigates the mechanisms behind the exposure estimates
  - Can one interpret the results as ***causal effects of neighborhoods*** or ***"power of place"***?
  - The role of **selection** and **sorting**
- Examines identifying assumptions in Chetty et al. (2018): Selection effects do not vary with the child's age when moving
  - This requires children potential outcomes to be orthogonal to their age when families move across neighborhoods
- Documents life cycle heterogeneity in the nbhd sorting process that invalidates the assumption of constant selection effects
- Conducts a placebo test to examine the credibility of the estimation strategies for identifying long-run nbhd effects

Preview of Results

- I find similar estimates to those of Chetty et al. (2018)
- I provide evidence for a violation of the main identifying assumption (constant selection effects) in previous studies
  - Self-selection into "permanent residency" status and into timing of moves (wrt the age of children)
  - Families **sort into** heterogenous areas and the age of child when parents move is not orthogonal to the extent to which there is a positive sorting between parents and neighborhoods:
  - Higher correlation of later moves with income/family shocks
- Placebo tests suggest: exposure effect estimates in the literature reflect the correlational estimates of place effects

Section 1: Literature Review

Challenges and Questions

- What do we learn from previous works about the role of nbhd?
  - schools, crime, peer effects, air quality, etc
- Measurement errors
  - poor measures of neighborhood quality
  - static measures
- External validity:
  - not clear implication for non-movers: identification
  - large-scale impacts and GE effects
- Methodology:
  - output-based measures of neighborhood quality
  - rank-rank analysis (welfare implications)
  - lack of a life-cycle approach
  - statistical uncertainty surrounding neighborhood upward mobility estimates (Mogstad et al. (2022))
- Identifying assumptions
  - complementarity between early- and late-childhood investments
  - constant-in-age selection

Chetty et al. (2018):

THE IMPACTS OF NEIGHBORHOODS ON INTERGENERATIONAL MOBILITY I: CHILDHOOD EXPOSURE EFFECTS

Data

- **Data source:** Federal income tax records
- **Data span:** 1996–2012
- **Sample:** Children who were born between 1980–1988
  - permanent residents (stayers/PR): subset of parents who reside in a single CZ c in 1996–2012.
  - movers: individuals in the main sample who are not PR
- **Income type:** Adjusted gross inc. (1040 tax return) + tax-exempt interest inc. and the nontaxable SSDI benefits
  - averaged over 1996-2000 to get parent inc; age 24 for child
- **Unit of Analysis:** Family income
- **Estimation Sample:** Only PR and those who moved across NBHDs *exactly once during 1996–2012*

TABLE I

Summary Statistics for CZ Permanent Residents and Movers

Variable	Mean (1)	Std. dev. (2)	Median (3)	Num. of obs. (4)
Panel A: Permanent residents: Families who do not move across CZs				
Parent family income	89,909	357,194	61,300	19,499,662
Child family income at 24	24,731	140,200	19,600	19,499,662
Child family income at 26	33,723	161,423	26,100	14,894,662
Child family income at 30	48,912	138,512	35,600	6,081,738
Child individual income at 24	20,331	139,697	17,200	19,499,662
Child married at 26	0.25	0.43	0.00	12,997,702
Child married at 30	0.39	0.49	0.00	6,081,738
Child attends college between 18–23	0.70	0.46	1.00	17,602,702
Child has teen birth (females only)	0.11	0.32	0.00	9,670,225
Child working at age 16	0.41	0.49	0.00	13,417,924
Panel B: Families who move 1–3 times across CZs				
Parent family income	90,468	376,413	53,500	4,374,418
Child family income at 24	23,489	57,852	18,100	4,374,418
Child family income at 26	31,658	99,394	23,800	3,276,406
Child family income at 30	46,368	107,380	32,500	1,305,997
Child individual income at 24	19,091	51,689	15,600	4,374,418
Child married at 26	0.25	0.43	0.00	2,867,598
Child married at 30	0.38	0.49	0.00	1,305,997
Child attends college between 18–23	0.66	0.47	1.00	3,965,610
Child has teen birth (females only)	0.13	0.33	0.00	2,169,207
Child working at age 16	0.40	0.49	0.00	3,068,421
Panel C: Primary analysis sample: families who move exactly once across CZs				
Parent family income	97,064	369,971	58,700	1,553,021
Child family income at 24	23,867	56,564	18,600	1,553,021
Child family income at 26	32,419	108,431	24,500	1,160,278
Child family income at 30	47,882	117,450	33,600	460,457
Child individual income at 24	19,462	48,452	16,000	1,553,021
Child married at 26	0.25	0.43	0.00	1,016,264
Child married at 30	0.38	0.49	0.00	460,457
Child attends college between 18–23	0.69	0.46	1.00	1,409,007
Child has teen birth (females only)	0.11	0.32	0.00	769,717
Child working at age 16	0.39	0.49	0.00	1,092,564

Geographical Variation in Outcomes of PR

- Given birth cohort s and CZ c, let p be the parents' percentile in the national income distribution
- Let y_i denote the child's national income rank in adulthood

Geographical Variation in Outcomes of PR- Cont'd

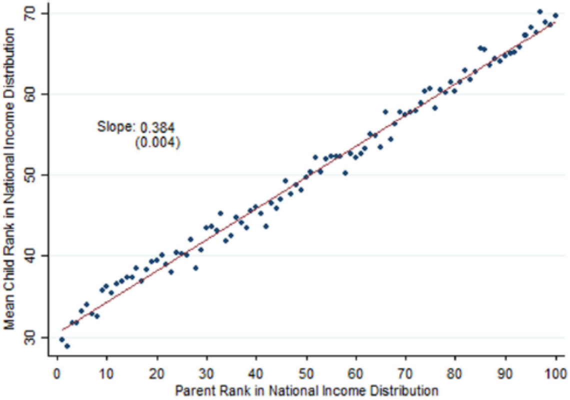


FIGURE I

Mean Child Income Rank versus Parent Income Rank for Children Raised in Chicago

CZs

Geographical Variation in Outcomes of PR

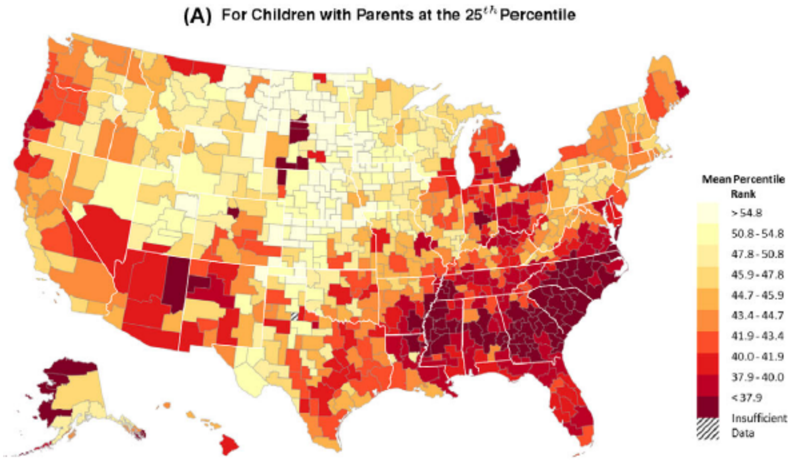
$$y_i = \alpha_{cs} + \psi_{cs} p_i + \epsilon_i$$

then, estimate y_{pcs}, the mean rank of children with parents at percentile p of the income distribution in CZ c in birth cohort s, using the fitted values:

$$\bar{y}_{pcs} = \hat{\alpha}_{cs} + \hat{\psi}_{cs} p$$

For example, $\bar{y}_{25,c,1980} = 40.1$ for children growing up at the 25th percentile of the national income distribution and $\bar{y}_{75,c,1980} = 59.3$ for children growing up at the 75th percentile.

Mean Inc. Ranks for Children with Parents at 25^{th} Pctile



Exposure Effects

Exposure effect at age m: the impact of spending year m of one's childhood in an area where PR's outcomes are 1 pp higher

Thought experiment: randomly assign children to new NBHD d starting at age m for the rest of childhood. The best linear predictor of children's outcomes y_i in the experimental sample, based on the PR's outcomes in CZ d ($\bar{y}_{pds}$):

$$y_i = \alpha_m + \beta_m \bar{y}_{pds} + \theta_i \quad (3)$$

Random assignment: $\theta \perp \bar{y}_{pds}$

Exposure effect at m: $\gamma_m = \beta_m - \beta_{m+1}$, the effect on y_i of spending the year from age m to age m + 1 in the destination

Observational data: $b_m = \beta_m + \delta_m$

Bias $= \delta_m = \frac{cov(\theta_i, \bar{y}_{pds})}{var(\bar{y}_{pds})}$: parent inputs & unobserved det. of children's outcomes covary with PR's outcomes

Exposure Effects- Constant-in-Age Selection Assumption

$$\text{Bias} = \delta_m = \frac{cov(\theta_i, \bar{y}_{pds})}{var(\bar{y}_{pds})}$$

ASSUMPTION 1 (A.1): Selection effects do not vary with the child's age at move: $\delta_m = \delta$ for all m.

Under A.1, we obtain consistent estimates of exposure effects:

$$\gamma_m = (\beta_m + \delta_m) - (\beta_{m+1} + \delta_{m+1}) = b_m - b_{m+1}$$

- Selection effects δ cancel out when estimating the exposure effect.
- Rules out differential preferences among parents by age of child for local amenities (schools) not captured by income
- Even an stronger assumption when identifying county level estimates (Chetty & Hendren (2018b))

Exposure Effects- Estimation

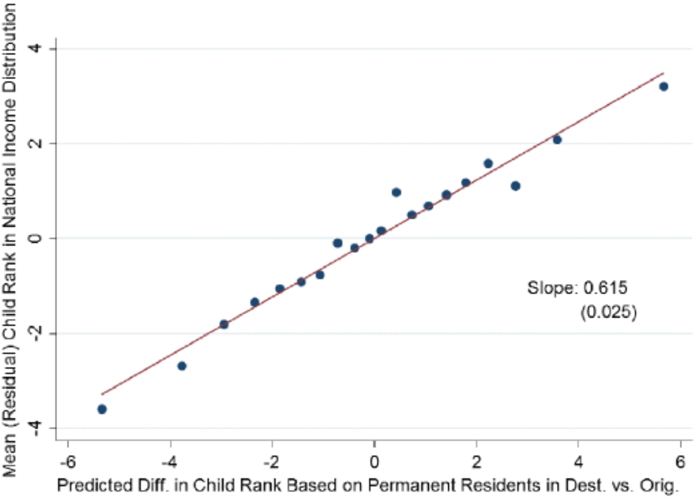
To begin, consider the set of children whose families moved when they were exactly m years old.

We can analyze how these children's incomes in adulthood are related to those of PR in their destination CZ using the following linear regression:

$$y_i = \alpha_{qos} + b_m \Delta_{odps} + \epsilon_{1i}, \qquad (4)$$

where y_i denotes the child's income rank at age 24, α_{qos} is a fixed effect for the origin CZ o by parent income decile q by birth cohort s and $\Delta_{odps} = \bar{y}_{pds} - \bar{y}_{pos}$ is the difference in predicted income rank (at age 24) of permanent residents in the destination versus origin for the relevant parent income rank p and birth cohort s.

Movers' Outcomes versus Predicted Outcomes Based on PR in Destination- Movers at Age 13



Childhood Exposure Effects on Inc. Ranks in Adulthood

(5)

$$y_i = \alpha_{qosm} + \sum_{m=9}^{30} b_m I(m_i = m)\Delta_{odps} + \sum_{s=1980}^{1987} \kappa_s I(s_i = s)\Delta_{odps} + \varepsilon_{2i},$$

Δ_{qosm}: (origin $\times$ parent income decile $\times$ birth cohort $\times$ age) FE

$\hat{b}_m$: the average effect on age-24 income rank y_i , conditional on moving from o to d at age m, of a 1 percentile increase in Δ_{odps}

Childhood Exposure Effects on Inc. Ranks in Adulthood

(5)

$$y_i = \alpha_{qosm} + \sum_{m=9}^{30} b_m I(m_i = m)\Delta_{odps} + \sum_{s=1980}^{1987} \kappa_s I(s_i = s)\Delta_{odps} + \varepsilon_{2i},$$

Δ_{qosm}: (origin $\times$ parent income decile $\times$ birth cohort $\times$ age) FE

$\hat{b}_m$: the average effect on age-24 income rank y_i , conditional on moving from o to d at age m, of a 1 percentile increase in Δ_{odps}

Alternative: parametric model estimating cohort- and age-specific slopes instead of FE

$$y_i = \sum_{s=1980}^{1988} I(s_i = s)\left(\alpha_s^1 + \alpha_s^2 \bar{y}_{pos}\right) + \sum_{m=9}^{30} I(m_i = m)\left(\zeta_m^1 + \zeta_m^2 p_i\right)$$

$$(6) \qquad + \sum_{m=9}^{30} b_m I(m_i = m)\Delta_{odps} + \sum_{s=1980}^{1987} \kappa_s^d I(s_i = s)\Delta_{odps} + \varepsilon_{3i}.$$

Results: $\hat{b}_m$ as Function of Age m

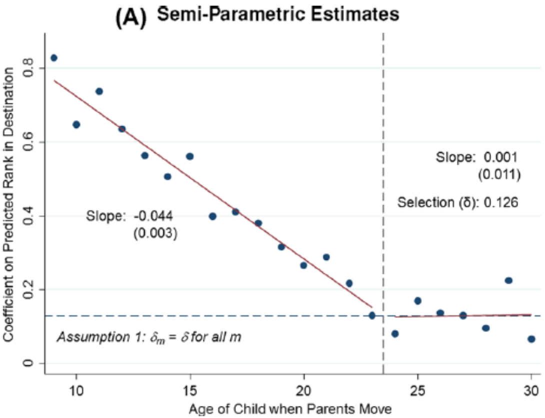


FIGURE IV

Childhood Exposure Effects on Income Ranks in Adulthood

Results: $\hat{b}_m$ as Function of Age m- Parametric Estimates

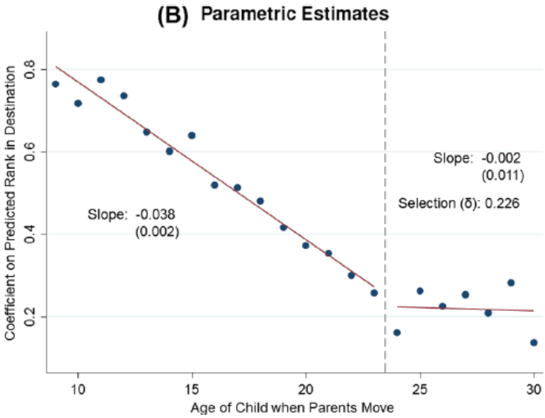


FIGURE IV

Childhood Exposure Effects on Income Ranks in Adulthood

Childhood Exposure Effect Estimates- Specification

$$y_i = \sum_{s=1980}^{1988} I(s_i = s)\left(\alpha_s^1 + \alpha_s^2 \bar{y}_{pos}\right) + \sum_{m=9}^{30} I(m_i = m)\left(\zeta_m^1 + \zeta_m^2 p_i\right)$$

$$+ \sum_{s=1980}^{1987} \kappa_s^d I(s_i = s)\Delta_{odps} + I(m_i \leqslant 23)\left(b_0 + (23 - m_i)\gamma\right)\Delta_{odps}$$

$$(7) \quad + I(m_i > 23)(\delta + (23 - m_i)\delta')\Delta_{odps} + \varepsilon_{3i}.$$

Childhood Exposure Effect Estimates- Results

TABLE II

CHILDHOOD EXPOSURE EFFECT ESTIMATES

	Dependent variable: Child's income rank at age 24								
							With family fixed effects		
Specification:	Pooled	Age $\leqslant$ 23	Age < 18	No cohort controls	Individual income	Child CZ FE	Baseline	No cohort controls	Time-varying controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Exposure effect (γ)	0.040	0.040	0.037	0.036	0.041	0.031	0.044	0.031	0.043
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.002)	(0.008)	(0.005)	(0.008)
Num. of obs.	1,553,021	1,287,773	687,323	1,553,021	1,553,021	1,473,218	1,553,021	1,553,021	1,553,021

Section 2: Neighborhood Exposure Effects in Denmark

Data

- **Data source:** Danish registers
- **Data span:** 1980–2017
- **Sample:** Children who were born between 1970–1982
  - permanent residents (stayers/PR): subset of parents who reside in a single *municipality (parish)* c in 1982–2000
  - movers: individuals in the main sample who are not PR
- **Income type:** Disposable income
  - averaged over 1982–2000 to get parental income
- **Unit of Analysis:** Family income for parents and individual income for children

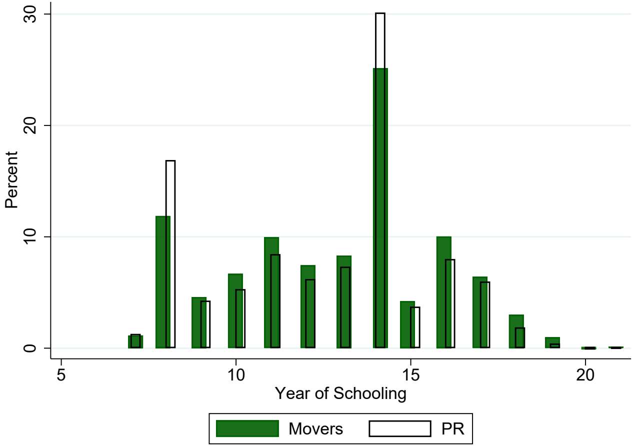
Summary Statistics

Table 1: Summary Statistics for Municipality Permanent Residents and Movers

Variable	Mean (1)	Std. dev. (2)	Median (3)	Num. of obs. (4)
Panel A: Permanent residents: Families who do not move across municipalities				
Child individual income at 30	25,495	9,710	25,415	536,993
Child family income at 30	43,090	19,368	44,476	536,072
Child cohabiting at 30	0.67	0.47	1.00	537,801
Child years of schooling by 30	14.68	2.37	14.50	524,959
Child individual property value at 30	81,794	99,120	69,070	529,849
Parent family income	43,832	13,272	42,660	527,670
Parent property value	109,882	79,499	106,692	525,677
Nuclear (intact) Family	0.62	0.49	1.00	484,164
Panel B: Families who move 1-3 times across municipalities				
Child individual income at 30	24,880	10,007	24,846	258,295
Child family income at 30	41,732	19,911	42,257	257,744
Child cohabiting at 30	0.65	0.48	1.00	258,592
Child years of schooling by 30	14.50	2.55	14.50	251,296
Child individual property value at 30	69,105	92,740	47,726	255,337
Parent family income	43,586	13,549	41,948	252,652
Parent property value	94,273	77,781	86,069	251,903
Nuclear (intact) Family	0.39	0.49	0.00	234,262
Panel C: Families who move exactly once across municipalities				
Child individual income at 30	25,197	10,066	25,146	157,428
Child family income at 30	42,313	19,955	42,968	157,119
Child cohabiting at 30	0.65	0.48	1.00	157,633
Child years of schooling by 30	14.63	2.51	14.50	153,221
Child individual property value at 30	72,892	94,934	54,975	155,601
Parent family income	44,180	13,879	42,528	154,143
Parent property value	100,761	78,964	94,480	153,667
Nuclear (intact) Family	0.45	0.50	0.00	143,172

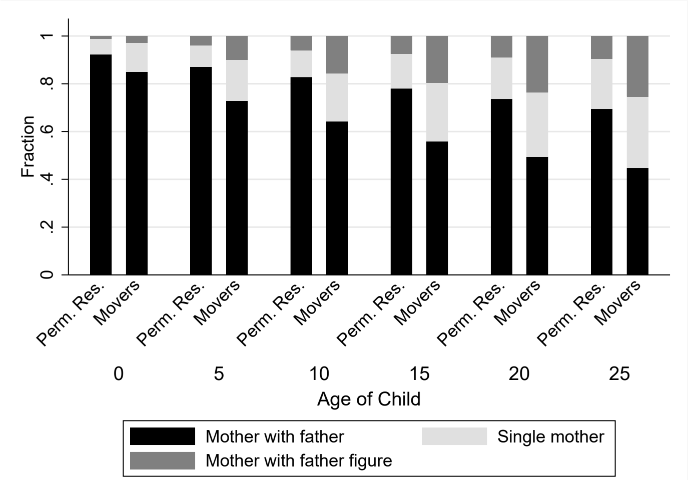
Education Level and PR Status

Figure: Distribution of Years of Schooling by Permanent Residency Status



Family Structure of Movers and Residents

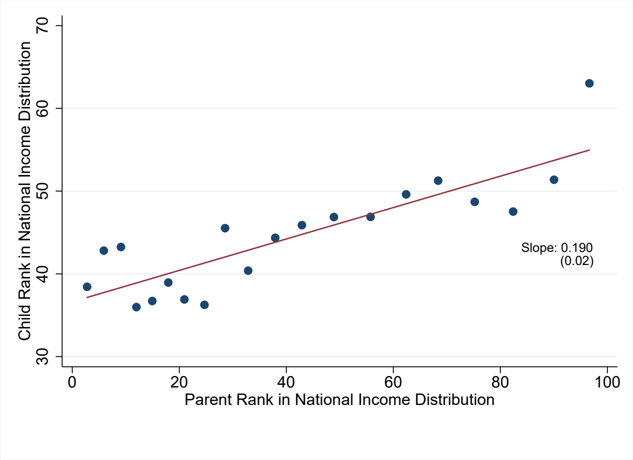
Figure: Family Structure over the Life Cycle by Permanent Residency Status



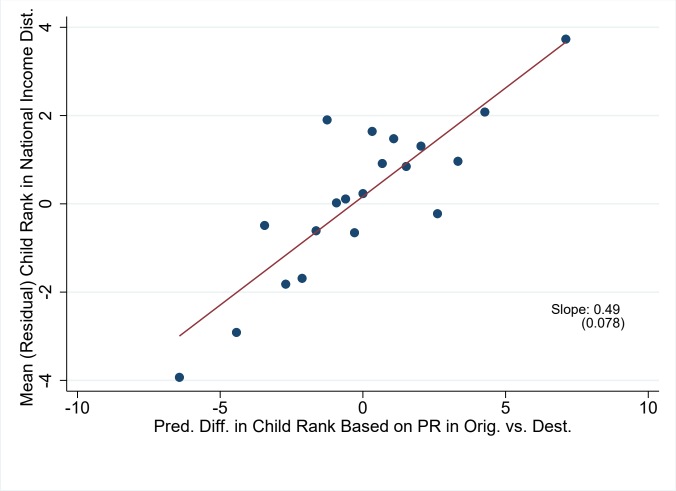
Neighborhood Exposure Effects

Mean Income Ranks for Children of PR of Copenhagen

Figure: Mean Child Inc. Rank vs Parent Inc. Rank for Children



Movers' Outcomes versus Predicted Outcomes Based on PR in Destination- Movers at Age 13

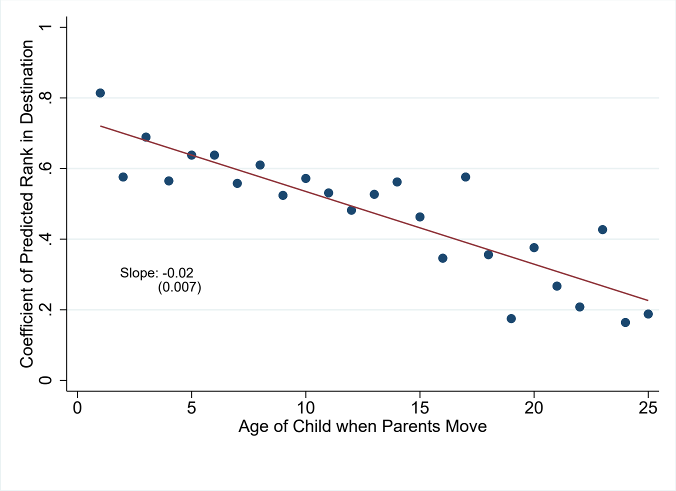


Childhood Exposure Effect Estimates- Specification

$$
\begin{aligned}
y_i = & \sum_{s=1980}^{1988} I(s_i = s)\left(\alpha_s^1 + \alpha_s^2 \bar{y}_{pos}\right) + \sum_{m=9}^{30} I(m_i = m)\left(\zeta_m^1 + \zeta_m^2 p_i\right) \\
& + \sum_{s=1980}^{1987} \kappa_s^d I(s_i = s)\Delta_{odps} + I(m_i \leqslant 23)\left(b_0 + (23 - m_i)\gamma\right)\Delta_{odps} \\
& + I(m_i > 23)(\delta + (23 - m_i)\delta')\Delta_{odps} + \varepsilon_{3i}. \qquad (7)
\end{aligned}
$$

Childhood Exposure Effects on Inc. Ranks

Figure: Childhood Exposure Effects on Income Ranks in Adulthood



Childhood Exposure Effect Estimates

Dependent Variable: Child's Income Rank in Adulthood (Age 30)

Specification:	Pooled	Age <= 23	Age < 18	No cohort controls	Family Income	Child nbhd FE	Family FE: Baseline	Family FE: No cohort controls	Family FE: Time-varying controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
US: Exposure Effect (γ)	0.040	0.040	0.037	0.036	0.041	0.031	0.044	0.031	0.043
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.002)	(0.008)	(0.005)	(0.008)
Denmark: Exposure Effect (γ)	0.023	0.023	0.019	0.016	0.016	0.021	0.020	0.017	0.023
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)	(0.013)	(0.009)	(0.015))
Number of Obs.:	107,289	102,521	80,237	107,289	107,123	107,252	107,289	107,289	107,289

Heterogeneity of Exposure Effects by Ownership Status

Table 3: Heterogeneity of Childhood Exposure Effect Estimates

Dependent Variable: Child's Income Rank in Adulthood (Age 30)

Specification:	Pooled	Age <= 23	Age < 18	No cohort controls	Family Income	Child nbhd FE	Family FE: Baseline	Family FE: No cohort controls	Family FE: Time-varying controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Homeowners									
Exposure Effect (γ)	0.027 (0.006)	0.027 (0.006)	0.024 (0.008)	0.026 (0.005)	0.018 (0.006)	0.025 (0.006)	0.001 (0.020)	0.000 (0.016)	-0.028 (0.031))
Number of Obs.:	37,503	33,122	24,544	37,503	37,444	37,494	37,503	37,503	37,503
Panel B: Renters									
Exposure Effect (γ)	0.018 (0.006)	0.018 (0.006)	0.011 (0.007)	0.015 (0.005)	0.013 (0.006)	0.016 (0.006)	0.035 (0.019)	0.026 (0.012)	0.031 (0.024))
Number of Obs.:	56,646	52,574	43,459	56,646	56,547	56,621	56,646	56,646	56,646

Discussion of the Identifying Assumptions: A Statistical Approach

Identification

Exposure effect at age m: the impact of spending year m of one's childhood in an area where PR's outcomes are 1 pp higher

Thought experiment: randomly assign children to new NBHD d starting at age m for the rest of childhood. The best linear predictor of children's outcomes y_i in the experimental sample, based on the PR's outcomes in CZ d ($\bar{y}_{pds}$):

$$y_i = \alpha_m + \beta_m \bar{y}_{pds} + \theta_i \quad (3)$$

Random assignment: $\theta \perp \bar{y}_{pds}$

Exposure effect at m: $\gamma_m = \beta_m - \beta_{m+1}$, the effect on y_i of spending the year from age m to age m + 1 in the destination

Observational data: $b_m = \beta_m + \delta_m$

Bias $= \delta_m = \frac{cov(\theta_i, \bar{y}_{pds})}{var(\bar{y}_{pds})}$: parent inputs & unobserved det. of children's outcomes covary with PR's outcomes

Exposure Effects- Constant-in-Age Selection Assumption

Bias $= \delta_m = \frac{cov(\theta_i, \bar{y}_{pds})}{var(\bar{y}_{pds})}$

ASSUMPTION 1 (A.1): Selection effects do not vary with the child's age at move: $\delta_m = \delta$ for all m.

Under A.1, we obtain consistent estimates of exposure effects:

$$\gamma_m = (\beta_m + \delta_m) - (\beta_{m+1} + \delta_{m+1}) = b_m - b_{m+1}$$

Even in observational data because the selection effects δ cancel out when estimating the exposure effect.

Rules out differential preferences among parents by age of child for local amenities, such as school quality, that are not fully captured in adult income percentile rank $\bar{y}_{pds}$

What if Assumption A.1 Is violated?

Under A.1:

$$\gamma_m = (\beta_m - \beta_{m+1}) + (\delta_m - \delta_{m+1}) = b_m - b_{m+1}$$

If A.1 is violated:

1. If sorting decreases in child's age:
   $\delta_m > \delta_{m+1} \quad \forall m \in \{\underline{m}, ..., \overline{m}\} \Rightarrow$ equ (3) overestimates the exposure effect, γ_m
2. If sorting becomes stronger as age increases:
   $\delta_m < \delta_{m+1} \quad \forall m \in \{\underline{m}, ..., \overline{m}\} \Rightarrow$ equ (3) underestimates the exposure effect, γ_m.
3. Unclear if sorting not monotonically changes over the age support exploited for the estimation.

Parental Selection based on Education

Chetty (2018) estimates:

$$y_i = \alpha + \beta_m \Delta_{odps} + \epsilon_i, \qquad (4)$$

Parent's education level is one of the omitted variables affecting both child's outcome and quality of the move across NBHDs.

Let's assume that the true model is as follows:

$$y_i = \alpha + \beta_m \Delta_{odps} + \beta_e edu_i^p + u_i, \qquad (5)$$

Then,

$$Plim\ \hat{\beta}_m = \beta_m + \beta_e \frac{cov(edu_i^p, \Delta_{pds})}{var(\Delta_{pds})}$$

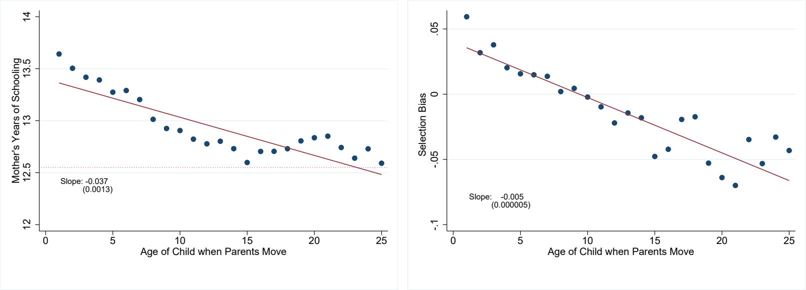
$$= \beta_m + \beta_e \delta_m$$

$$Plim\ \hat{\gamma}_m = (\beta_m - \beta_{m+1}) + \beta_e(\delta_m - \delta_{m+1})$$

Intensity of Sorting by Age of Child at Move

Figure: Intensity of Sorting b/w Parent's Education and Quality of Move

(a) Parental Education (b) Selection Bias by Age



Back-of-the-envelope Calculation of the Bias

To evaluate the size of the bias, $\beta_e(\delta_m - \delta_{m+1})$:

1. Using equ (5), obtain some estimates for β_e: $\hat{\beta}_e \in [0.82, 1.15]$
2. Using the slope of covariance term (between parents' education level and quality of the move) over age of child, obtain an estimate for $(\delta_m - \delta_{m+1})$: $(\delta_m - \delta_{m+1}) \approx 0.005$

What Does an Economic Model of Neighborhood Choice Predict?

A Simple Framework

- Consider a set of heterogeneous families who are different with respect to:
  - Information about neighborhood impacts
  - Access to credit markets
  - Children's potential gains from exposure to better neighborhoods
  - Altruistic preferences
- Assume that each family is allowed to move only once during the first 18 years after arrival of their first child.
- Assume that house price is a sufficient statistic for neighborhood quality.

Sorting Patterns: Who Moves Earlier?

- Families who are less credit constraints move earlier
- More informed parents are willing to pay higher interest rates to move earlier
- Families sort on the gain from moves: families with high potential children move earlier
- The sorting pattern is more pronounced under dynamic complementarity

Section 3: Further Empirical Evidence: Life Cycle Heterogeneity in the Neighborhood Sorting Process

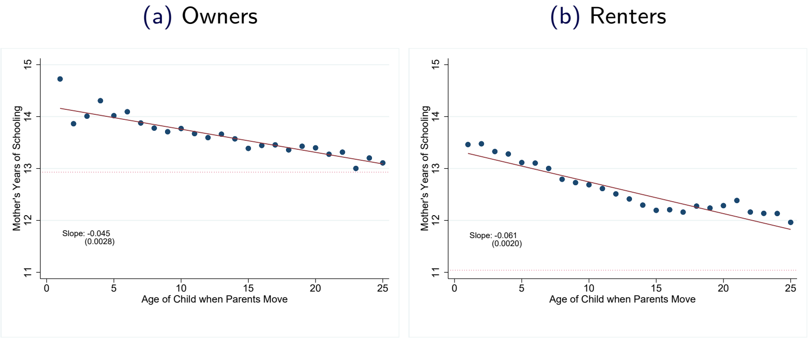
(A) Selection and Age of Child at Move:

(A.i) Parental Characteristics

(A.i-1) Education

Parental Char. and Age of Child when Parents Move

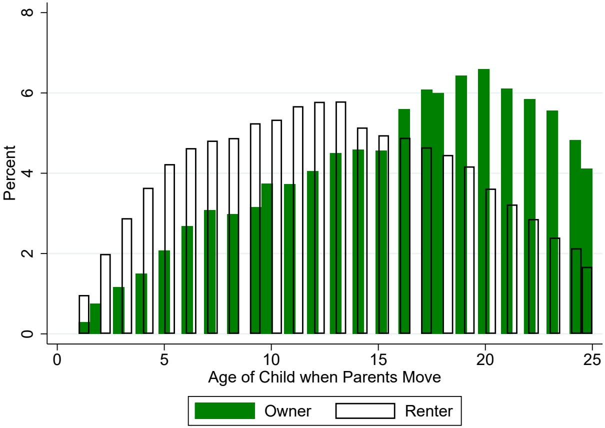
Figure: Age of Child at Move and Parental Edu. by Ownership Status



▸ parish

Distribution of Age of Child at Move- by Ownership Status

Figure: Timing of Moves across Neighborhoods by Home Ownership



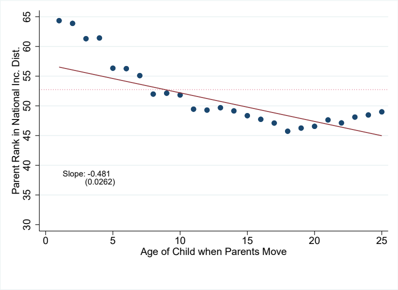
(A) Selection and Age of Child at Move:

(A.i) Parental Characteristics

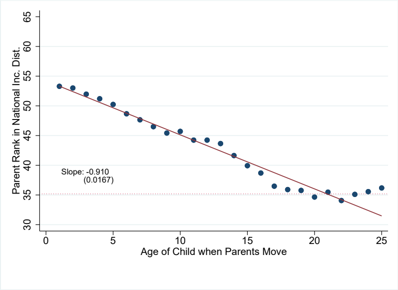
(A.i-2) Income

Figure: Parental Income Rank and Age of Child when Parents Move

(a) Owners



(b) Renters



(A) Selection and Age of Child at Move:

(A.i) Parental Characteristics

(A.i-3) Family Structure

(A) Selection and Age of Child at Move:

(A.i) Parental Characteristics

(B) Parental Sorting to Neighborhoods:

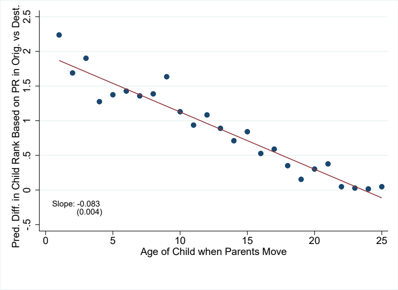
(B.i) Quality of Moves

(B.i-1) Difference in Mean Income Ranks of Children of PR's in Orig. vs Dest.

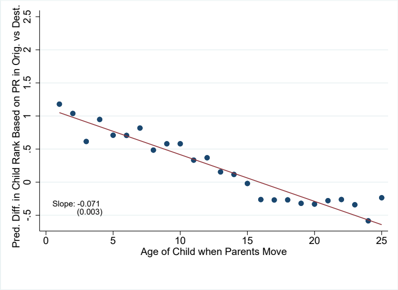
The Quality of Moves and Age of Child at Move

Figure: The Quality of Moves by Ownership Status

(a) Owners



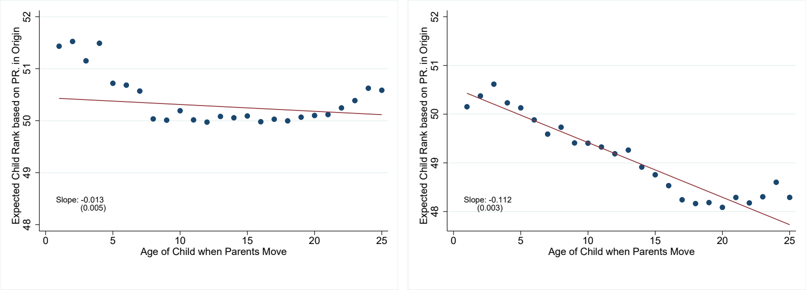
(b) Renters



The Quality of Origin and Age of Child at Move

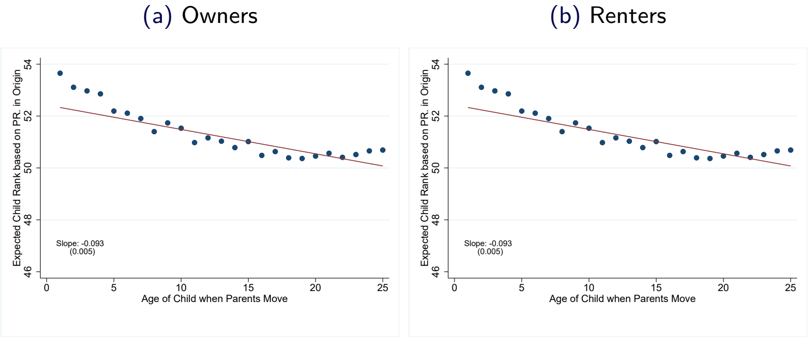
Figure: The Quality of Moves by Ownership Status

(a) Owners (b) Renters



The Quality of Destination and Age of Child at Move

Figure: The Quality of Moves by Ownership Status



(B) Parental Sorting to Neighborhoods:

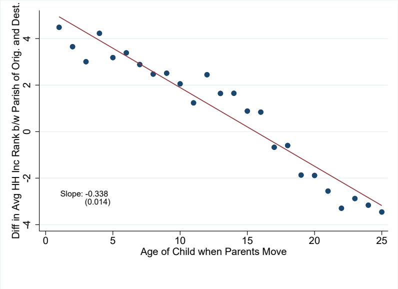
(B.i) Quality of Moves

(B.i-2) NBHD Avg Inc Rank at Orig. vs Dest.

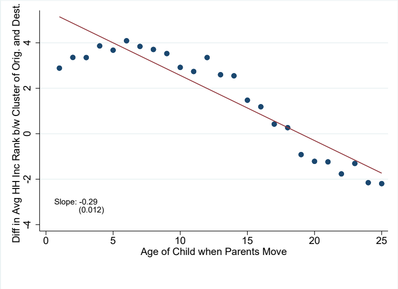
NBHD Income Rank and Age of Child at Move

Figure: Change in NBHD Inc Rank and Age of Child

(a) Parish Level



(b) Cluster Level



(B) Parental Sorting to Neighborhoods:

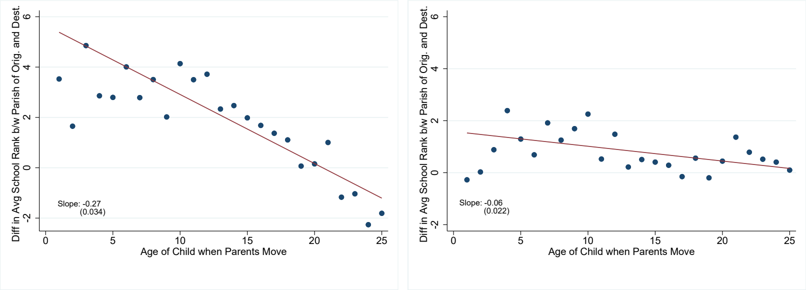
(B.i) Quality of Moves

(B.i-3) School Quality Rank at Orig. vs Dest.

NBHD (Parish) School Quality Rank and Age at Move

Figure: Change in nbhd School Rank (Math Grades) and Age of Child

(a) Owners (b) Renters



(B) Parental Sorting to Neighborhoods:

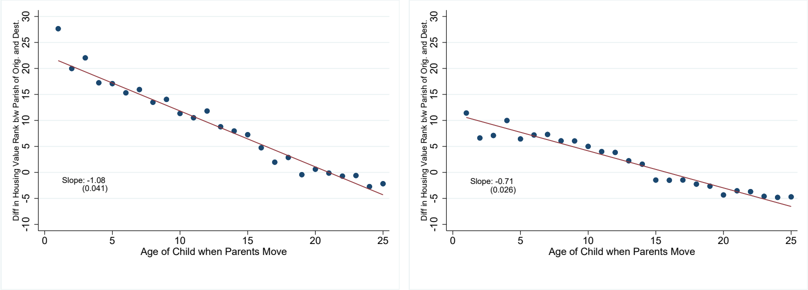
(B.i) Quality of Moves

(B.i-4) Average Neighborhood House Price Rank

Neighborhood (Parish) House Price Rank and Age of Child at Move

Figure: Change in NBHD House Price Rank. and Age of Child

(a) Owners (b) Renters



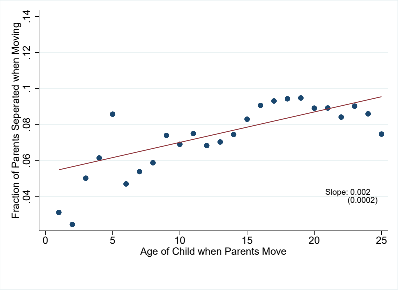
(C) Timing of Moves and Lifecycle Shocks

(C.i) Divorce

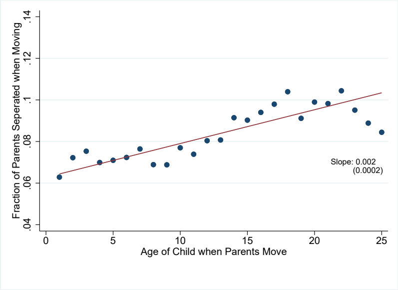
Divorce and Age of Child at Move

Figure: Age of Child at Move & Frac. of Parents Separated when Moving

(a) Owners



(b) Renters

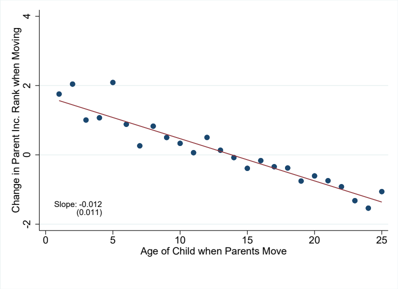


(C) Timing of Moves and Lifecycle Shocks

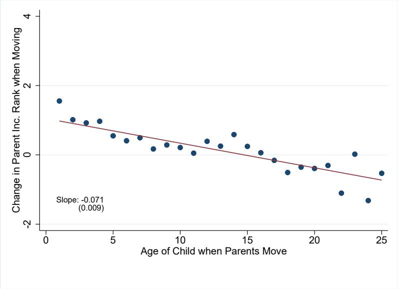
(C.ii) Change to Income when Moving

Figure: Age of Child at Move and the Change to Family Inc. Rank

(a) Owners



(b) Renters



(D) Family Fixed Effect and Exogeneity Assumption

Family Fixed Effect Model

- Authors address time-varying selection possibility by adding family FE to the parametric model (and, separately, by controlling for changes in parents' income and marital status):

$$y_i = \sum_{s=1980}^{1988} I(s_i = s)\left(\alpha_s^1 + \alpha_s^2 \bar{y}_{pos}\right) + \sum_{m=9}^{30} I(m_i = m)\left(\zeta_m^1 + \zeta_m^2 p_i\right)$$

$$(6) \qquad + \sum_{m=9}^{30} b_m I(m_i = m)\Delta_{odps} + \sum_{s=1980}^{1987} \kappa_s^d I(s_i = s)\Delta_{odps} + \varepsilon_{3i}.$$

- Regression is now should estimated entirely on sample of families with 2 children. Intuitively, family-level mean effects are taken out.

Childhood Exposure Effect Estimates- Results

TABLE II

CHILDHOOD EXPOSURE EFFECT ESTIMATES

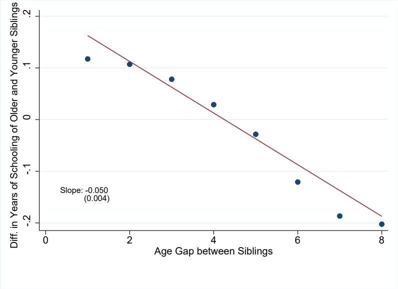
	Dependent variable: Child's income rank at age 24								
							With family fixed effects		
Specification:	Pooled	Age $\leqslant$ 23	Age < 18	No cohort controls	Individual income	Child CZ FE	Baseline	No cohort controls	Time-varying controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Exposure effect (γ)	0.040	0.040	0.037	0.036	0.041	0.031	0.044	0.031	0.043
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.002)	(0.008)	(0.005)	(0.008)
Num. of obs.	1,553,021	1,287,773	687,323	1,553,021	1,553,021	1,473,218	1,553,021	1,553,021	1,553,021

Discussion: Family Fixed Effect Model

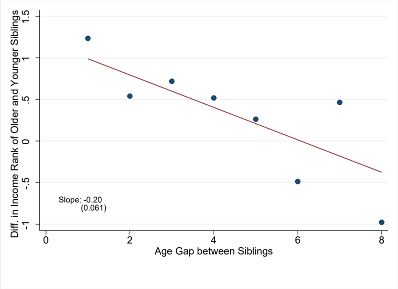
- Suppose we can write $\epsilon_i = \hat{\theta}_{fam,i} + e_i$
  - $\hat{\theta}_{fam,i}$: fixed family inputs (culture, parents' HC, etc.)
  - e_i: variable inputs (e.g., wealth shocks, noise)
- The selection assumption: $\delta_m = \frac{cov(\epsilon_i, \bar{y}_{pds})}{var(\bar{y}_{pds})}$ is constant in age
- Including family fixed effects controls for $\hat{\theta}_{fam}$: if higher-skill families choose better neighborhoods at earlier ages
- To interpret results as *causal* still need $\frac{cov(e_i, \bar{y}_{pds})}{var(\bar{y}_{pds})}$ cons. in age
  - May be violated if shocks to wealth are corr. with child's age
  - One such shock correlated with first child's age: the birth of a 2^{nd} child
  - Meaningful differences between families where kids are 2 years vs. 8 years apart.

Figure: Time Space and Differences in Sibling Outcomes

(a) Years of Schooling



(b) Income Ranks



Section 4: Placebo Tests Using Later Cohorts (1997-2005)

Placebo Tests

- Examine the credibility of the estimation strategies for identifying long-run neighborhood effects
- The extent to which nbhd exposure estimates are driven by the sorting of heterogeneous families across nbhd with different amenities rather than by causal impacts of nbhd on children
- Data on birth characteristics of children born between 1997-2005 in Denmark
- Chetty & Hnedren (2018a) investigate how children's earnings in adulthood are related to the quality of the destination neighborhood and the child's age when moving
- I examine how a child's birth length is related to such factors
- One expects to find insignificant estimates. Otherwise, the effect would be preceding the cause

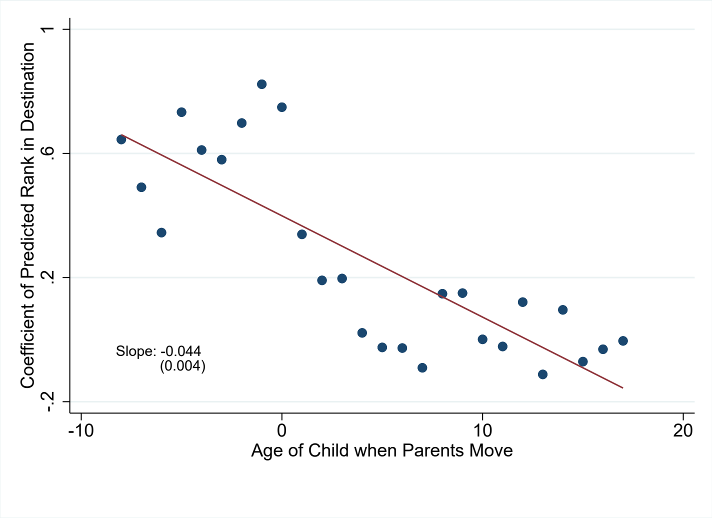
Placebo Exposure Effect Estimates

$$bl_i = \sum_{s=1997}^{2005} \kappa_s I(s_i = s)(\alpha_s^1 + \alpha_s^2 \bar{bl}_{pos}) + \sum_{m=1}^{20} I(m_i = m)(\zeta_m^1 + \zeta_m^2 p_i)$$
$$+ \sum_{m=1}^{20} \beta_m I(m_i = m)\Delta_{odps}^{bl} + \sum_{s=1997}^{2004} \kappa_s^d I(s_i = s)\Delta_{odps}^{bl} + \epsilon_{3i},$$

where bl_i denotes the child's percentile rank on her position in the national birth length distribution relative to all others in her birth cohort, and $\Delta_{odps}^{bl} = \bar{bl}_{pds} - \bar{bl}_{pos}$ is the mean difference in permanent residents' birth length ranks between the destination and origin for the relevant parent income rank p and birth cohort s.

Placebo Tests

Figure: Placebo Effects Using Birth Length



Placebo Exposure Effect Estimates- Parametric Estimates

$$
\begin{aligned}
bl_i = &\sum_{s=1997}^{2005} \kappa_s I(s_i = s)(\alpha_s^1 + \alpha_s^2 \bar{bl}_{pos}) + \sum_{m=1}^{20} I(m_i = m)(\zeta_m^1 + \zeta_m^2 p_i) \\
&+ \sum_{s=1997}^{2004} \kappa_s^d I(s_i = s)\Delta_{odps}^{bl} + I(m_i \geq 0)(b_0 + m_i\gamma)\Delta_{odps}^{bl} \\
&+ I(m_i < 0)(\delta_0 + m_i\delta')\Delta_{odps}^{bl} + \epsilon_{3i},
\end{aligned}
$$

Placebo Estimates

Dependent Variable: Child's Birth Length Rank

							Family FE		
Specification:	Pooled	Age >= 0	Age < 22	No cohort controls	Family Level	Child nbhd FE	Baseline	No cohort controls	Time-varying controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
US: Exposure Effect (γ)	0.040	0.040	0.037	0.036	0.041	0.031	0.044	0.031	0.043
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.002)	(0.008)	(0.005)	(0.008)
Denmark: Placebo Effect (γ)	0.044	0.045	0.031	0.044	–	0.043	0.028	0.033	0.029
	(0.006)	(0.006)	(0.006)	(0.006)	–	(0.006)	(0.014)	(0.014)	(0.014)
Number of Obs.:	127,536	73,746	133,159	127,536	—	127,536	127,536	127,536	127,536

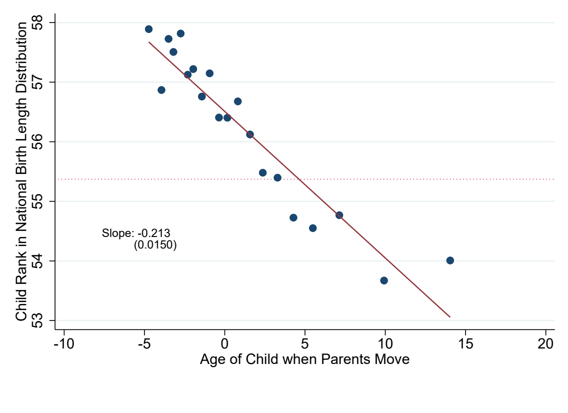
Placebo Estimates by Homeownership Status

Dependent Variable: Child's Birth Length Rank

Specification:	Pooled	Age >= 0	Age < 22	No cohort controls	Family Level	Child nbhd FE	Family FE: Baseline	Family FE: No cohort controls	Family FE: Time-varying controls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Homeowners									
Placebo Effect (γ)	0.048	0.048	0.027	0.046	–	0.048	0.038	0.044	0.037
	(0.010)	(0.010)	(0.007)	(0.010)	–	(0.010)	(0.022)	(0.021)	(0.022)
Number of Obs.:	56,541	40,115	58,616	56,541	—	56,541	56,541	56,541	56,541
Panel B: Renters									
Placebo Effect (γ)	0.040	0.040	0.028	0.040	–	0.038	0.010	0.023	0.011
	(0.009)	(0.009)	(0.007)	(0.009)	–	(0.009)	(0.022)	(0.021)	(0.022)
Number of Obs.:	45,923	27,053	48,479	48,918	—	45,923	45,923	45,923	45,923

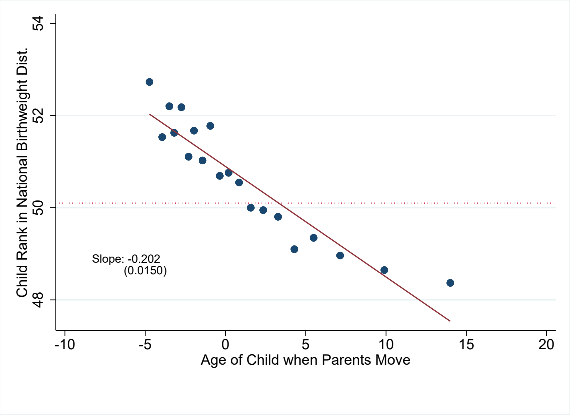
Age of Child at Move and Child Potential Outcomes

Figure: Birth Length Rank and the Age of the Child at the Time of the Move



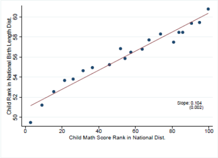
Age of Child at Move and Child Potential Outcomes

Figure: Birth Weight Rank and the Age of the Child at the Time of the Move

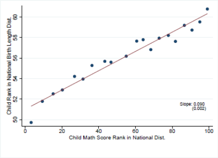


Birth Length and Academic Achievement

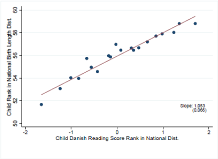
Figure: Birth Length Rank and the Age of the Child at the Time of the Move



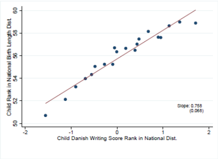
(a) Mathematics Knowledge



(b) problem-solving



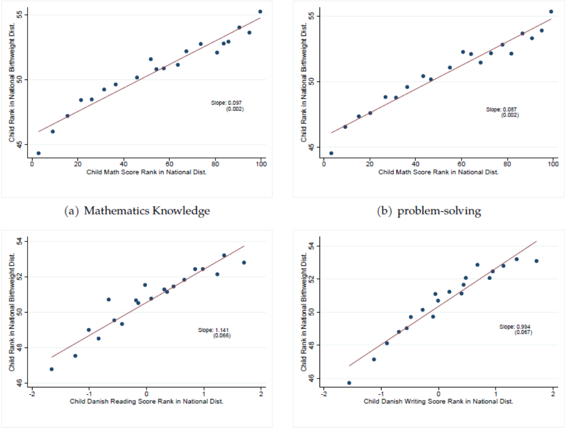
(c) Reading



(d) Writing

Birth Weight and Academic Achievement

Figure: Birth Weight Rank and the Age of the Child at the Time of the Move



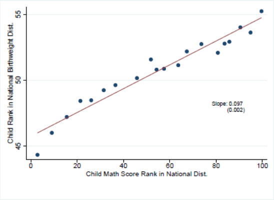
(a) Mathematics Knowledge

(b) problem-solving

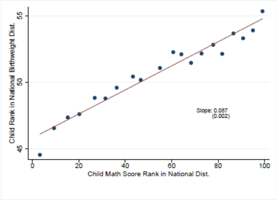
(c) Reading

(d) Writing

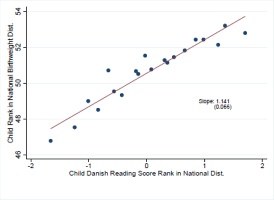
Figure: Test Scores and Adulthood Income Rank



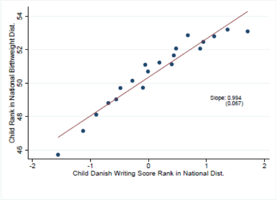
(a) Mathematics Knowledge



(b) problem-solving



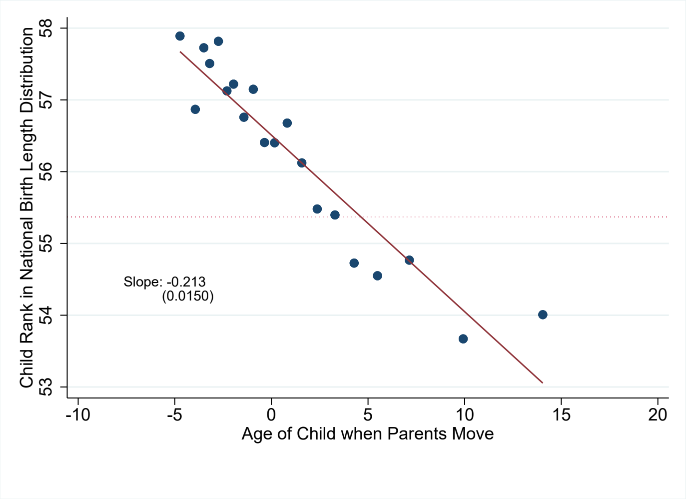
(c) Reading



(d) Writing

Age of Child at Move and Child Potential Outcomes

Figure: Birth Weight Rank and the Age of the Child at the Time of the Move



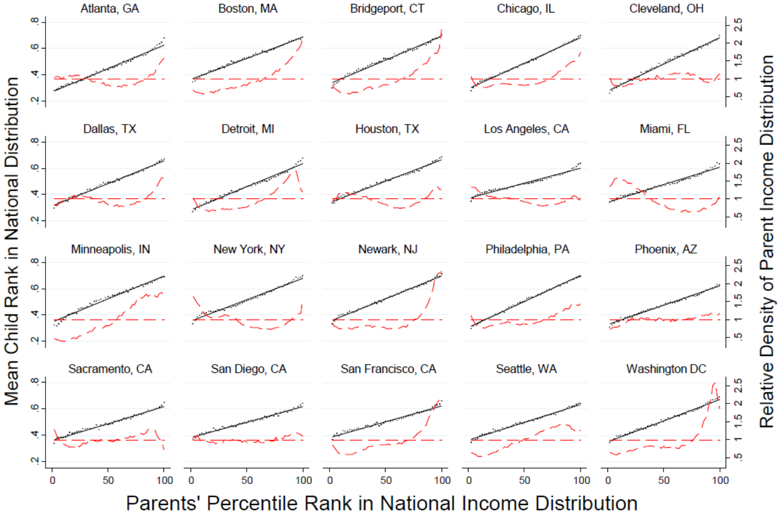
Conclusion

- Recent studies have exploited quasi-experimental strategies to identify the causal impact of NBHDs on children.
- One of the main challenges in estimating the causal impact of NBHDs on child is the endogeneity of NBHD quality.
- I investigate the methodology and main identifying assumptions of the influential studies in the literature.
- Parental sorting into NBHDs has an important lifecycle gradient; it is not orthogonal to age of children at the time of the move.
- The constant selection effects assumption in recent empirical works is violated $\rightarrow$ overestimating NBHD impacts on children
- The placebo tests clearly showcase the methodological problems of the popular studies in the literature.

Thanks!

Appendix

Geographical Variation in Outcomes of PR- across CZs



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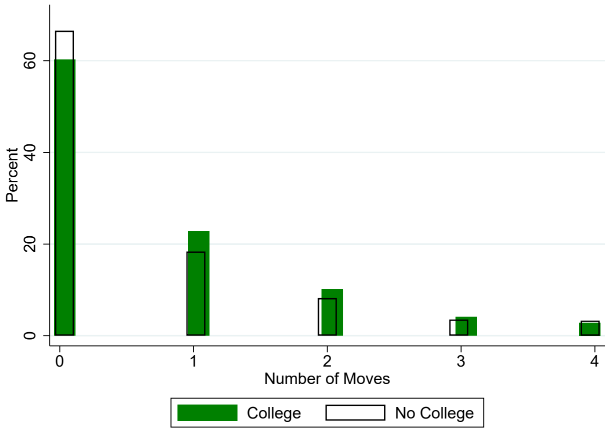
Number of Moves

Figure: Number of Moves by Education Level



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