Early life determinants of long-run outcomes

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Early life determinants of long-run outcomes

Almond and Currie's 2011 *Handbook of Labor Economics* chapter

- Growing recognition among economists that early life conditions can have persistent impacts on later life outcomes
- Chapter reviews and synthesizes literature on:
  1. Early childhood influences on later life outcomes
  2. Policies aiming to ameliorate effects of negative shocks
- Take-away: *"Child and family characteristics measured at school entry do as much to explain future outcomes as factors that labor economists have more traditionally focused on, such as years of education. Yet while children can be permanently damaged at this age, an important message is that the damage can often be remedied."*

Roadmap for today

Handbook chapter: Almond and Currie (2011)

- Preliminaries: models of health/human capital
- Prenatal environments:
  - Birth weight: Black, Devereux, and Salvanes (2007)
- Policy responses:
  - Infant health care: Bharadwaj, Løken, and Nielson (2011)
  - Head Start: Ludwig and Miller (2007)
  - Foster care: Doyle (2007)

Preliminaries

Almond and Currie present a theoretical framework to illustrate why evidence of a causal relationship between a shock in early childhood and a future outcome says little about whether the relationship in question is biological or immutable

- Parental/social responses are likely to be extremely important in either magnifying or mitigating the effects of a shock

Traditional models of "health capital"

Grossman (1972)

- Models health as a stock variable that depreciates over time, and which can increase due to health investments
- Structure of depreciation implies that as individuals age, effects of early childhood health stock and health investments become progressively less important over time

In contrast: "early childhood" research asks whether health and early life investments have sustained effects on adult outcomes

Two-period model

Two-period model of childhood production of health or human capital h accumulated at the completion of childhood:

$$
\begin{aligned}
h &= A[\gamma I_1 + (1-\gamma) I_2] \\
I_1 &\simeq \text{investments during childhood through age 5} \\
I_2 &\simeq \text{investments during childhood after age 5}
\end{aligned}
$$

- Leave open the question of whether there is depreciation
- For a given level of investment $(I_1 + I_2)$, allocation of investment across periods matters if $\gamma \neq 0.5$
- If $\gamma A > 1$, certain childhood periods may exert a disproportionate effect on later life outcomes that does not necessarily decline monotonically with age

Functional form

Somewhat extreme functional form: $h = A[\gamma I_1 + (1-\gamma)I_2]$
$\Rightarrow$ first and second period investments are perfect substitutes

Heckman (2007) proposes a more flexible CES functional form:

$$h = A[\gamma I_1^{\phi} + (1-\gamma)I_2^{\phi}]^{\frac{1}{\phi}}$$

- For a given level of investment $(I_1 + I_2)$, how the allocation of investment across periods will affect h depends on elasticity of substitution $(\frac{1}{1-\phi})$ and share parameter (γ)
- Simplifies to the more restrictive functional form if $\phi = 1$
  $\Rightarrow$ investments are perfectly substitutable

Using this framework

Almond and Currie consider effect of exogenous shocks μ_g to health investments that occur during the first childhood period

- Fixed investments: "biological" relationship (holds behavior fixed)
- Responsive investments
  - Key idea: unless investment responses are costless, damage estimates of $\frac{\partial h}{\partial \mu_g}$ will tend to understate total costs (anecdote: my dad)
  - Investment responses can be either reinforcing or compensatory
  - Recent papers have used *e.g.* time use data to measure parental investments (example: Royer 2009)
  - Almond-Currie conclude *"...as of now there is little evidence that parents in developed countries systematically reinforce or compensate for early childhood events"*

Prenatal environments

So-called "Barker hypothesis"

- Disruptions to prenatal environment presage chronic health conditions in adulthood, including heart disease and diabetes
  - Rapid prenatal growth $\Rightarrow$ long-term effects
  - Contrasts with idea of mothers as an effective "buffer"
- See also Almond-Currie (*JEP* forthcoming)

Prenatal environments

Almond-Currie review evidence on three sets of prenatal factors:

1. Maternal health (*e.g.* Almond 2006)
2. Economic shocks (*e.g.* Cutler, Miller, and Norton 2007)
3. Pollution (*e.g.* Chay and Greenstone 2003)

Focus here on link between birth weight and long-run outcomes

- Black, Devereux, and Salvanes (2007)

Birth weight and long-run outcomes

Earliest study I know of: Currie-Hyson (1999)

- British National Child Development Survey data
- Conditional on (rich) observables: low birth weight associated with long-term disadvantages in self-reported health status, educational attainment, and labor market outcomes
- But: birth weight routinely found to be strongly associated with socio-economic background variables, some of which are likely unobserved $\Rightarrow$ difficult to ascertain a causal link

Twin studies

Earliest study I know of: Behrman-Rosenweig (2004)

- Schooling of identical female twins $\frac{1}{3}$ of a year longer for each pound increase in birth weight (454 grams)
- Important advance, but small sample (402 twin pairs)

Three subsequent twin studies:

- Canada: Oreopoulos, Stabile, Walld, and Roos (2009)
- Norway: Black, Devereux, and Salvanes (2007)
- US: Royer (2009) [also looks at investments]

Aside: Almond, Chay, and Lee (2005)

Thoughtful, important paper on twin estimation

- Investigate effect of LBW on health care costs
- OLS and twin FE estimates

Emphasize OLS/FE difference can support two interpretations:

1. FE could “solve” OVB
2. Different sources of variation in birth weight could have different effects on child outcomes
    - Birth weight itself not a policy variable
    - One focus: short gestation vs. intrauterine growth retardation
    - Alternative policies could have different effects

Black, Devereux, and Salvanes (2007)

- Examine short- and long-run effects of birth weight
- Birth records for the census of Norwegian births from 1967-97
  - Link to administrative data: infant (one-year) mortality, APGAR, height, BMI, IQ, education, labor market outcomes, birth weight of first child...

Table 3

Table 3: pooled OLS and twin FE estimates

- For mortality, pooled OLS coefficient of 280 implies that a 10 percent increase in birth weight would reduce 1-year mortality by approximately 28 deaths per 1,000 births. The twin fixed effects coefficient of 41 is statistically significant but only $\frac{1}{6}$ the size of the OLS coefficient
- Short-run outcomes: OLS $>$ IV
- Long-run outcomes: OLS $\sim$ IV

Table 3

TABLE III
REGRESSION RESULTS: TWINS SAMPLE COEFFICIENT ON LN (BIRTH WEIGHT)

Dependent variable	Singleton sample: OLS	Singleton sample: Family fixed effects	Twins sample: OLS	Twins sample: Twin fixed effects
One-year mortality	−123.46** (1.71)	−186.71** (.69)	−279.64** (9.12)	−41.10** (7.64)
N	1,253,546		33,366	
Five minute APGAR score	.73** (.01)	1.08** (.01)	1.46** (.06)	.35** (.07)
N	674,577		21,580	
Height (males only)	11.03** (.11)	7.33** (.12)	7.48** (.55)	5.68** (.56)
N	203,741		5,382	
BMI (males only)	−6.19 (7.67)	−22.22 (15.23)	.56** (.23)	1.12** (.30)
N	203,378		5,372	
Underweight	−.09** (.004)	−.07** (.01)	−.07** (.02)	−.11** (.04)
N	203,378		5,372	
Overweight	.08** (.01)	.08** (.01)	.03 (.02)	.09** (.04)
N	203,378		5,372	
IQ (males only)	.91** (.03)	.58** (.04)	.48** (.14)	.62** (.18)
N	184,045		4,920	
High school completion	.16** (.01)	.04** (.01)	.07** (.02)	.09** (.04)
N	536,020		13,106	
Full-time work	.17** (.004)	.21** (.01)	.29** (.02)	.03 (.05)
N	368,582		10,388	
ln(earnings) FT	.09** (.01)	.08** (.01)	.09** (.03)	.12** (.06)
N	239,906		5,952	
ln(birth weight of first child)	.25** (.01)	.13** (.01)	.18** (.04)	.15** (.06)
N	63,842		1,962	

Standard errors are in parentheses. The control variables we use in the OLS estimation are year- and month-of-birth dummies, indicators for mother's education (one for each year), indicators for birth order, indicators for mother's year of birth, and an indicator for the sex of the child. Family fixed effects regressions include all of the above minus mother's education and mother's year of birth. Twin fixed effects regressions include indicators for sex and birth order of the twin (either first born or second born twin). Both cross-sectional and fixed effects regressions for height, BMI, and IQ also include indicator variables for the year the boy was tested by the military. High school completion indicates whether or not the individual has completed at least twelve years of schooling and is restricted to those twenty-one and older. The IQ measure is generated from a composite score from three speeded IQ tests—arithmetic, word similarities, and figures—and is reported in stanine (Standard Nine) units. Earnings are measured as total pension-qualifying earnings reported in the tax registry. These are not topcoded and include labor earnings, taxable sick benefits, unemployment benefits, parental leave payments, and pensions. We restrict attention to individuals aged at least twenty-five. Working full-time indicates whether individuals are full-time, full-year workers. To identify this group, we use the fact that our dataset identifies individuals who are employed and working full time (30+ hours per week) at one particular point in the year (in the second quarter in the years 1986-1995 and in the fourth quarter thereafter). We label these individuals as full-time workers. For ln(birth weight) of child, the sample consists of women born between 1967 and 1988 whose first births occurred by 2004. If the first birth is a twin birth, the woman is dropped from the sample.

** Denotes statistically significant at the 5 percent level.
* Denotes statistically significant at the 10 percent level.

Selective mortality

Twin pairs experiencing mortality dropped from the sample

- Time-series patterns consistent with idea that later life effects larger when sample includes more twins on margin of survival
  - Impact of birthweight on later outcomes has increased over time, as twin infant mortality has declined
- Investigate heterogeneity: APGAR-birth weight correlation
  - Birthweight has a larger effect on APGAR scores for the full sample of twin births, relative to the sample of twin births in which both twins live
- Taken together, authors conclude survival-induced selection bias most likely understates effects of birth weight on adult outcomes

Early childhood environments

"Early childhood environment" (birth to age 5)

Almond and Currie (2011) provide a comprehensive review:

- Infectious diseases (*e.g.* Chay *et al.* 2009)
- Health status (*e.g.* Smith 2009)
- Home environment (*e.g.* Rossin 2011)
- Pollution/toxins (*e.g.* Reyes 2007)

Focus here: infant health inputs and academic achievement

- Bharadwaj, Løken, and Nielson (2011)

Bharadwaj, Løken, and Nielson (2011)

- Quantify returns to medical spending on at-risk newborns
- Valuing *non-health* benefits important for health/social policy
- Variation: rules/recommendations generating discontinuity in health inputs at VLBW threshold at 1500 grams
  - Follows-up Almond *et al.* (2010) on US infants: estimate returns in terms of reduced probability of mortality
  - Key idea: infants at 1490 and 1510 should be similar in underlying health, but receive very different health inputs $\Rightarrow$ can apply a regression discontinuity design
- Data: Chile and Norway
  - Recommendations generate a nice placebo check: 31 weeks

Figure 1: Infant health inputs (Chile)

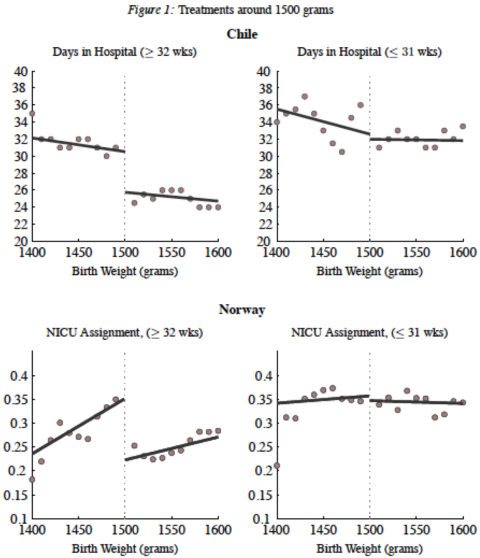

Figure 1: Infant health inputs (Norway)

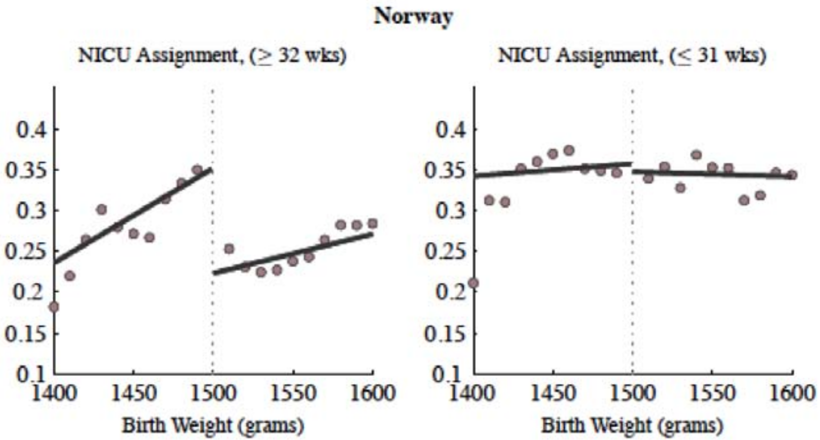

Figure 2: One-year mortality (Chile)

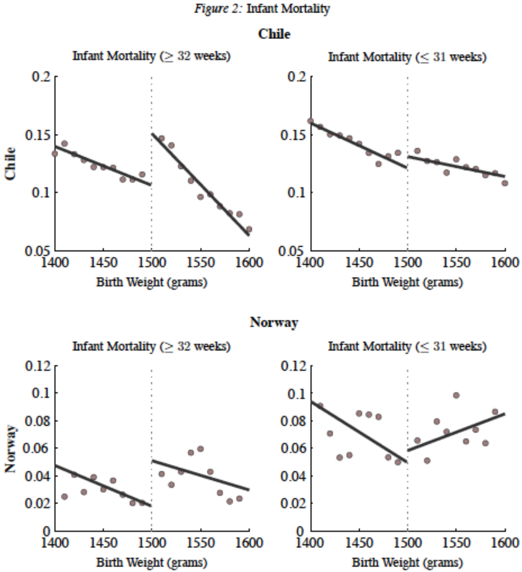

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Figure 2: One-year mortality (Norway)

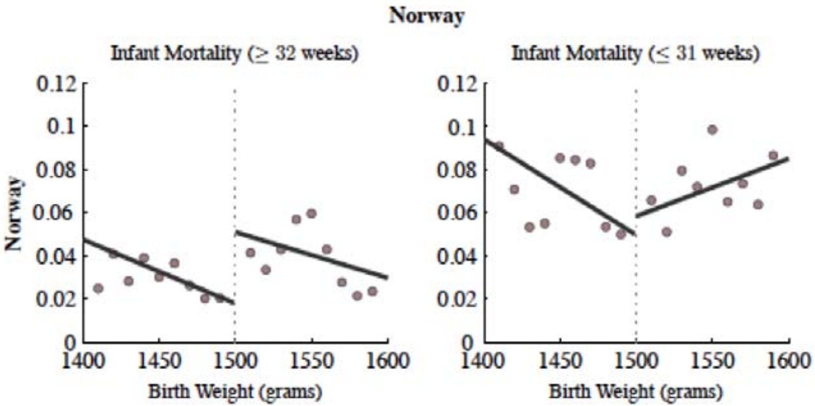

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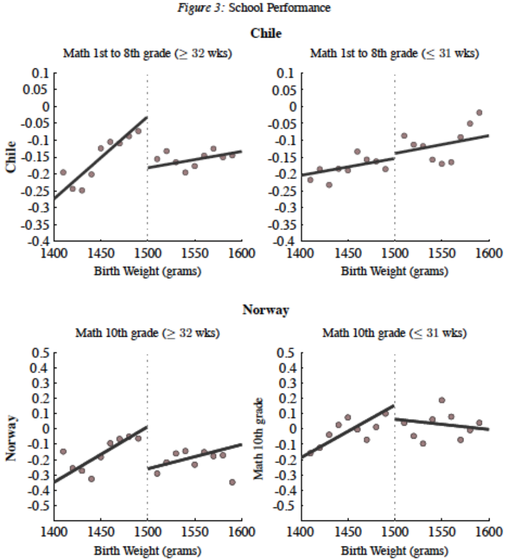
Figure 3: School performance (Chile)



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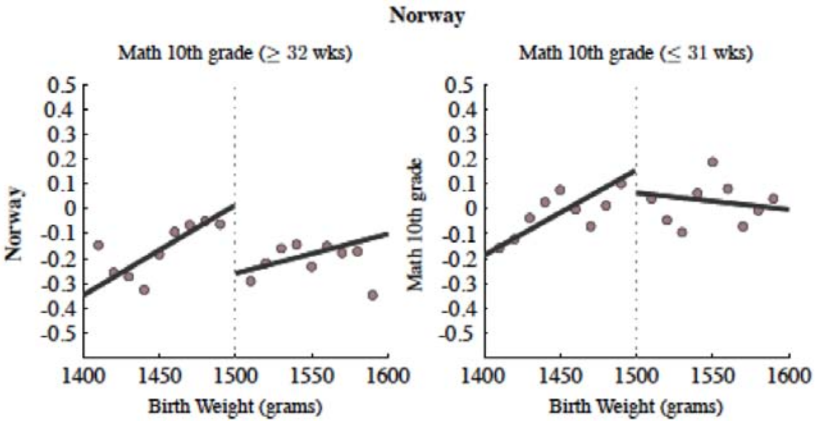

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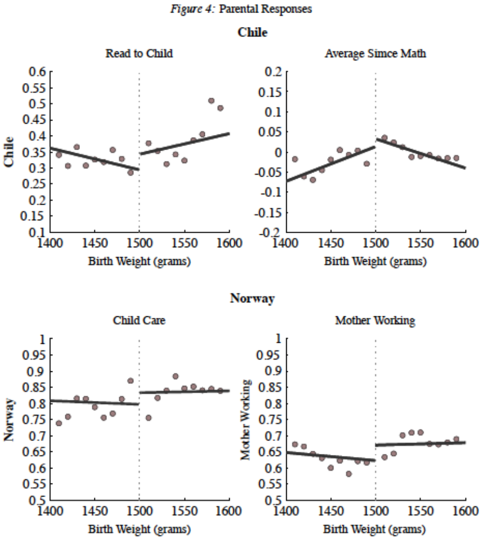
Figure 4: Parental investments (Chile)



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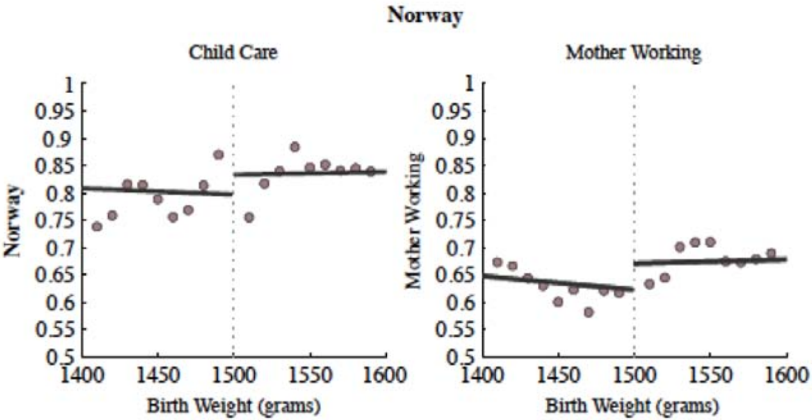

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Policy responses

Prenatal/early childhood factors can influence on later outcomes

- On its own, little to say about the effectiveness of remediation
- Almond-Currie review evidence on:
  - Income transfer programs (*e.g.* Dahl and Lochner 2005)
  - "Near cash" programs (*e.g.* Almond *et al.* forthcoming)
  - Early intervention programs (*e.g.* Olds' home nurse visits)
  - Health insurance (*e.g.* Hanratty 1996)

Focus here: Head Start and foster care

- Head Start: Ludwig-Miller (2007)
- Foster care: Doyle (2007)

Head Start

- Currie-Thomas (1995): sibling FE
  - No within-family differences in *e.g.* birth weight
  - Some time-varying characteristics of concern
  - Data suggests positive effects on educational attainment
- Deming (2009): long-term follow-up
  - Argues projected earnings gain sufficient to offset program cost
- Ludwig and Miller (2007): 1965 program introduction

Ludwig and Miller (2007)

When initially established, Head Start provided assistance to the 300 poorest counties to develop Head Start proposals

- "New" data (NARA): led to a substantial and persistent discontinuity in Head Start funding and participation rates
- No discontinuity in other federal per-capita spending
- Large drop in mortality from "Head Start causes"
- Suggestive effects on educational attainment

Figure 4: 1968 Head Start $ per 4-year-old

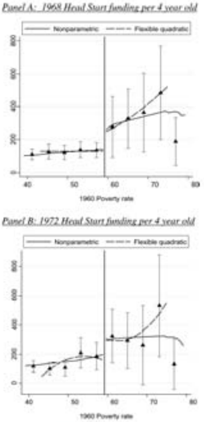

FIGURE II

Estimated Discontinuity in Head Start Funding per Four-Year-Old, National Archives. (A) 1968 Head Start funding per four-year-old and (B) 1972 Head Start funding per four-year-old

Notes: Each panel shows the nonparametric estimate (solid line) for the function relating 1960 county poverty rate to the dependent variable [$m(P_c)$ from (3) in the text] as well as the implied discontinuity (α) using a bandwidth of 18, a parametric estimate (dashed line) that uses a quadratic to model $m(P_c)$, and raw cell means (triangles) and their 95 percent confidence intervals (bars) from grouping the data into five categories on each side of the cutoff for counties with 1960 poverty rates from 40 to 80 percent. Panel A Estimated nonparametric discontinuity = 114.71 T-stat = 1.19, bandwidth = 18. Panel B Estimated nonparametric discontinuity = 89.96 T-stat = 0.83, bandwidth = 18.

Figure 4: Mortality

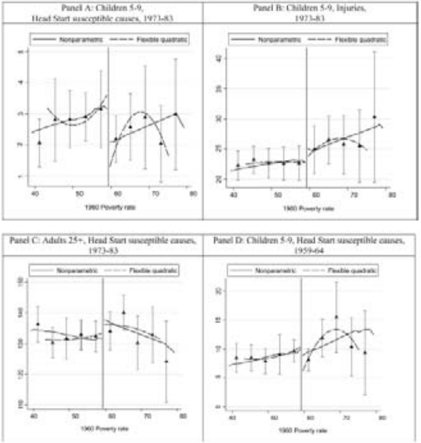

FIGURE IV

Estimated Discontinuities at OEO Cutoff in Mortality Rates per 100,000 for Children and Adults, from Causes Affected by Head Start and from Injuries

Note: Each panel shows the nonparametric estimate (solid line) for the function relating 1960 county poverty rate to the dependent variable [$m(P_c)$ from (3) in the text] as well as the implied discontinuity (α) using a bandwidth of 18, a parametric estimate (dashed line) that uses a quadratic to model $m(P_c)$, and raw cell means (triangles) and their 95 percent confidence intervals (bars) from grouping the data into five categories on each side of the cutoff for counties with 1960 poverty rates from 40 to 80 percent. Panel A, Estimated nonparametric discontinuity = −1.198 *T*-stat = 1.42, bandwidth = 18. Panel B, Estimated nonparametric discontinuity = 2.246 *T*-stat = 0.86, bandwidth = 18. Panel C, Estimated nonparametric discontinuity = 6.016 *T*-stat = 1.31, bandwidth = 18. Panel D, Estimated nonparametric discontinuity = −1.076 *T*-stat = 0.52, bandwidth = 18.

Foster care: Doyle (2007)

Important and thoughtful series of papers investigating child welfare service decisions over whether to leave abused or neglected children in their home, or to place them in foster care

- Key idea: removal tendency of child protection investigators
- Quasi-conditionally random assignment to investigators
- IV/marginal treatment effects framework
- New data: child welfare records linked to juvenile delinquency, teen motherhood, employment, and earnings

LATE: Conditions for interpretation

Usual conditions required for LATE interpretation:

1. First stage: instrument associated with foster care placement
2. Exclusion restriction: Z is not in the outcome equation
3. Monotonicity: any child removed by lenient investigator would also be removed by strict one; child not removed by strict case manager would not be removed by lenient one

Instrument: Placement decision model

Investigators observe cases along a distribution of abuse levels θ

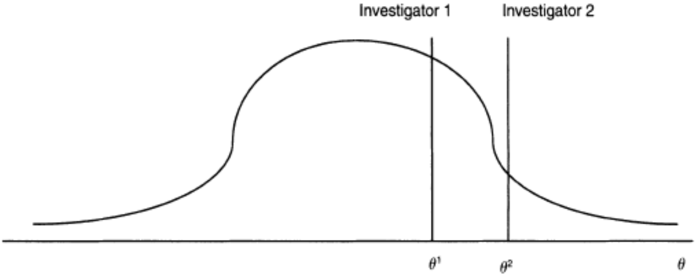

FIGURE 1. ABUSE THRESHOLDS FOR REMOVAL

Instrument: Placement decision model

- Investigator types are defined by the threshold abuse level required to recommend placement
- Each type observes same abuse levels $\Rightarrow$ types characterized by fraction of children recommended for placement (Z)
- Comparison of outcomes across investigator types focuses on variation in placement among marginal cases

Outcome variables

Three samples:

- Delinquency sample (Cook County)
- Teen motherhood sample (females)
- Employment sample

Table 2: Randomization check

TABLE 2—CHILD CHARACTERISTICS AND CASE MANAGER ASSIGNMENT: DELINQUENCY SAMPLE

Dependent variable: Case manager removal differential Variable		Coefficient	t	p-value
Initial reporter (Other reporter excluded)	Physician	−0.006	−0.81	0.416
	School	−0.005	−0.74	0.457
	Police	−0.008	−1.11	0.269
	Family	−0.003	−0.52	0.605
	Neighbor	−0.005	−0.73	0.464
	Other government	−0.007	−0.96	0.339
	Anonymous	−0.007	−1.07	0.287
Age at report (Youngest age excluded)	Age 6	0.005	0.41	0.679
	Age 7	0.012	1.07	0.284
	Age 8	0.009	0.90	0.367
	Age 9	0.015	1.42	0.156
	Age 10	0.008	0.72	0.470
	Age 11	0.009	0.94	0.346
	Age 12	0.010	0.99	0.324
	Age 13	0.013	1.26	0.207
	Age 14	0.009	0.91	0.366
	Age 15	0.009	0.89	0.373
Sex	Boy	−0.002	−1.20	0.232
Race/ethnicity (Other race excluded)	White	−0.014	−1.32	0.186
	African American	−0.015	−1.22	0.224
	Hispanic	−0.012	−0.88	0.377
Allegation (Other neglect excluded)	Physical abuse	−0.002	−0.43	0.668
	Substantial risk of harm	−0.006	−0.94	0.348
	Other abuse	0.003	0.43	0.670
	Lack of supervision	−0.005	−0.98	0.325
	Environmental neglect	−0.007	−1.29	0.199
	Mean of dependent variable	0.0001		
	Standard deviation	0.0921		
	F-statistic of joint significance	0.84		
	p-value	0.75		
	Number of case managers	409		
	Observations	15,039		

Note: t-statistics and F-statistic are calculated using standard errors clustered by case manager.

Table 3: F-test for joint significance

TABLE 3—CHILD CHARACTERISTICS AND CASE MANAGER ASSIGNMENT

Dependent variable: Case manager removal differential

Sample:	Delinquency (1)	Teen motherhood (2)	Employment (3)
F-statistic of joint significance	0.84	1.07	0.96
p-value	0.75	0.34	0.54
Mean of dependent variable	0.0001	−0.0007	−0.0007
Standard deviation of dependent variable	0.0921	0.1035	0.0729
Number of case managers	409	705	815
Observations	15,039	20,091	30,415

Notes: All models include full controls (individual year, month, and age indicators). F-statistics are calculated using standard errors clustered by case manager.

Table 4: First stage (delinquency sample)

Table 4—Case Manager Assignment and Foster Care Placement: Juvenile Delinquency Sample

Dependent variable: Case manager removal differential

	Model:	Probit			Probit		
		Coefficient	S.E.	*p*-value	Coefficient	S.E.	*p*-value
Key explanatory variables	Case manager removal differential	0.30	0.07	0.00	0.27	0.05	0.00
Initial reporter (Other reporter excluded)	Physician				0.10	0.03	0.00
	School				−0.02	0.03	0.43
	Police				0.14	0.03	0.00
	Family				0.05	0.03	0.06
	Neighbor				0.02	0.03	0.53
	Other government				0.07	0.03	0.03
	Anonymous				−0.06	0.03	0.02
Age at report (Youngest age excluded)	Age 6				0.05	0.05	0.21
	Age 7				0.05	0.04	0.18
	Age 8				0.02	0.04	0.66
	Age 9				0.03	0.04	0.44
	Age 10				0.03	0.04	0.42
	Age 11				0.02	0.04	0.55
	Age 12				0.00	0.04	0.97
	Age 13				−0.02	0.04	0.63
	Age 14				−0.04	0.04	0.32
	Age 15				−0.07	0.03	0.08
Sex	Boy				−0.01	0.01	0.14
Race/ethnicity (Other race excluded)	White				0.00	0.05	0.95
	African American				0.11	0.04	0.02
	Hispanic				−0.03	0.05	0.50
Allegation (Other neglect excluded)	Physical abuse				−0.07	0.02	0.00
	Substantial risk of harm				0.00	0.02	0.88
	Other abuse				−0.09	0.02	0.00
	Lack of supervision				0.00	0.02	0.89
	Environmental neglect				−0.08	0.02	0.00
	Chi-squared (1) stat.	17.9			27.8		
	Mean of dep. var.	0.27					
	Observations	15,039					

Note: Marginal effects and standard errors clustered at the case manager level are reported.

Table 5: First stage (all samples)

TABLE 5—CASE MANAGER ASSIGNMENT AS A PREDICTOR OF REMOVAL

Dependent variable: Foster care placement	Delinquency sample		Teen motherhood sample		Employment sample	
	(1)	(2)	(3)	(4)	(5)	(6)
Case manager removal differential	0.301	0.274	0.231	0.204	0.327	0.288
	(0.071)	(0.052)	(0.050)	(0.035)	(0.060)	(0.039)
Mean of dependent variable	0.27		0.21		0.23	
Chi-squared (1) statistic	17.9	27.8	21.5	34.2	29.3	55.0
Observations	15,039		20,091		30,415	
Full controls	No	Yes	No	Yes	No	Yes

Note: Results of probit models, with marginal effects and standard errors clustered at the case manager level, are reported.

Figure 2: local linear plot of first stage

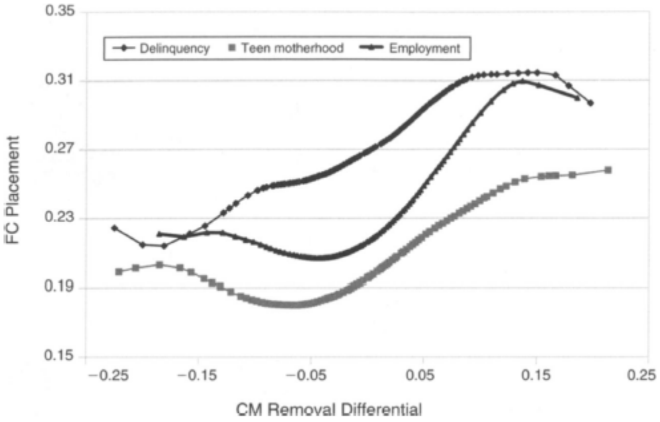

FIGURE 2. FC PLACEMENT VERSUS CASE MANAGER REMOVAL DIFFERENTIAL

Notes: Local linear regressions for the three samples. Bandwidth = 0.05.

Table 6: Juvenile delinquency

Table 6—Foster Care Placement and Juvenile Delinquency

Dependent variable: Juvenile delinquency

	Model:	Probit				IV Probit			
		Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
	FC placement	0.01	0.01	0.00	0.01	0.26	0.14	0.35	0.14
Initial reporter	Physician			0.00	0.02			−0.02	0.02
(Other reporter excluded)	School			0.00	0.02			0.00	0.02
	Police			0.02	0.02			−0.01	0.03
	Family			0.00	0.02			−0.01	0.02
	Neighbor			0.01	0.03			0.00	0.03
	Other government			0.03	0.02			0.01	0.02
	Anonymous			0.01	0.02			0.03	0.02
Age at report	Age 5			—	—			—	—
(Youngest age excluded)	Age 6			0.06	0.05			0.04	0.05
	Age 7			0.10	0.05			0.08	0.05
	Age 8			0.13	0.05			0.12	0.05
	Age 9			0.13	0.05			0.12	0.05
	Age 10			0.17	0.06			0.15	0.05
	Age 11			0.19	0.06			0.18	0.05
	Age 12			0.22	0.06			0.21	0.05
	Age 13			0.23	0.06			0.23	0.06
	Age 14			0.23	0.06			0.23	0.06
	Age 15			0.12	0.05			0.14	0.05
Sex	Boy			0.19	0.01			0.19	0.01
Race/ethnicity	White			−0.07	0.03			−0.07	0.03
(Other race excluded)	African American			−0.02	0.04			−0.05	0.04
	Hispanic			−0.07	0.03			−0.07	0.03
Allegation	Physical abuse			−0.01	0.02			0.01	0.02
(Other neglect excluded)	Substantial risk of harm			−0.03	0.01			−0.03	0.02
	Other abuse			−0.02	0.02			0.01	0.03
	Lack of supervision			−0.02	0.02			−0.03	0.02
	Environmental neglect			−0.02	0.02			0.00	0.02
	Mean of dep. var.	0.17							
	Observations	15,039							

Note: Marginal effects and standard errors clustered at the case manager level are reported.

Table 7: Teen motherhood

TABLE 7—FOSTER CARE PLACEMENT AND TEEN MOTHERHOOD

Dependent variable	Teen pregnancy			
Model	Probit (1)	Probit (2)	IV Probit (3)	IV Probit (4)
Foster care placement	0.106 (0.009)	0.090 (0.010)	0.171 (0.158)	0.291 (0.171)
Mean of dependent variable	0.35			
Full controls	No	Yes	No	Yes
Observations	20,091			

Note: Marginal effects and standard errors clustered at the case manager level are reported.

Table 8: Employment outcomes

TABLE 8—FOSTER CARE PLACEMENT AND EMPLOYMENT & EARNINGS

Dependent variable	Fraction of quarters working in 2002				Average quarterly earnings in 2002			
Model	OLS (1)	OLS (2)	2SLS (3)	2SLS (4)	OLS (5)	OLS (6)	2SLS (7)	2SLS (7)
Foster care placement	−0.023	0.002	−0.110	−0.154	−82.8	−50.4	−851	−1,296
	(0.006)	(0.006)	(0.120)	(0.113)	(29.5)	(30.6)	(597)	(626)
Mean of dep. var.	0.320				1,044			
Full controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	30,415							

Notes: Standard errors clustered at the case manager level are reported. Average quarterly earnings include those with zero earnings.

Figure 3: Marginal treatment effects

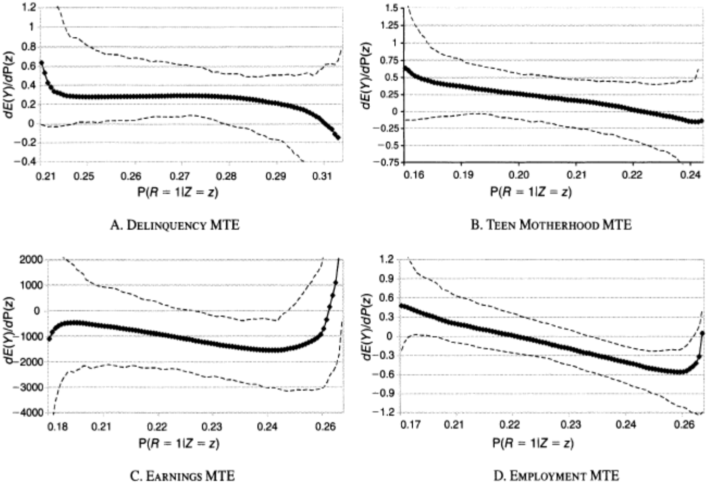

Figure 3

Notes: Figures report the results of a local quadratic estimator evaluated at each percentile of P(z). Confidence intervals of 5 to 95 percent reported, calculated using a bootstrap with 250 replications, clustered at the case manager level. Bandwidth = 0.037.

Take-aways

Important, thoughtful, and well-written paper

- Important set of institutions, but under-studied
- Novel data collection of meaningful outcome variables
- Nice econometrics blended with qualitative background
- Imprecise estimates, but still a high-impact paper

Wrap-up

Thanks for a great class :)

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