Maternal and Child Time Investments and the Cognitive Development of Children

Sehrish Mohammed-Hussein

Australian National University

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Research Question

- Rapid increases in cognitive development during early childhood (Shonkoff & Phillips 2000, Heckman 2006).
- Early life development is a key determinant of a child's outcomes (Currie & Thomas 1995, Keane & Wolpin 1997, Cameron & Heckman 1998, 2001, Heckman et al. 2006).
- What is the role of maternal investment and child's own investment on cognitive development?
- I focus on the type and duration of activity that children engage in with their mother and independently.

Previous Literature

- Prior studies estimate the effect of one or two measures of inputs (Brown 2006, Gentzkow & Shapiro 2008, Fiorini 2010, Huang & Lee 2010, Malamud & Pop-Eleches 2011, Suziedelyte 2015).

- Others proxy for a wide range of inputs using the 'HOME' index (Todd & Wolpin 2007, Paxson & Schady 2007, Cunha & Heckman 2008, Cunha et al. 2010).

- Recent work on parental educational or active time (Fiorini & Keane 2014, Del Boca et al. 2014, Del Bono et al. 2016).

- Two studies that take into account both parental and child time investments (Del Boca et al. 2017, Caetano et al. 2017).

Data

- Longitudinal Study of Australian Children (LSAC).
- Two cohorts of children: B cohort (0-1 years old in wave 1) and K cohort (4-5 years old in wave 1).
- Six waves.
- Time use diaries (TUD) available for cohort K for all waves and for cohort B for waves 1-3 and wave 6.
- Format of TUD changes after the first three waves.
- Information on what the child was doing, where the child was, and who was with the child.

Time Use Diaries - Categories

Recoded Categories:

1. Educational activities with mother
2. Educational activities alone
3. Sleep
4. Media
5. Organized lessons/activities
6. Play
7. School/Care
8. General care

Estimation Strategy

- $Y_{ia} = T'_{i\{N \times a\}} \alpha_{\{N \times a\}} + CPSB'_{i\{M \times a\}} \beta_{\{M \times a\}} + \epsilon_{ia}$
- Endogeneity of time inputs.
- Estimate different specifications based on Todd & Wolpin (2003, 2007), Fiorini & Keane (2014):
  1. Contemporaneous (CT)
  2. Value added (VA)
  3. Cumulative (CU)
  4. Cumulative and value added (CUVA)

2-3 Year Olds

	CT	VA	CU	CUVA
Meduc	0.022***	0.014***	0.023***	0.016**
	(0.004)	(0.004)	(0.006)	(0.006)
Aeduc	0.043	0.041	0.052	0.054
	(0.047)	(0.049)	(0.071)	(0.071)
Controls	Yes	Yes	Yes	Yes
Adjusted R^2	0.131	0.171	0.130	0.165
Observations	1,572	1,370	745	649

6-7 Year Olds

	CT	VA	CU	CUVA
Meduc	0.028**	0.026**	0.040**	0.034**
	(0.011)	(0.011)	(0.016)	(0.017)
Aeduc	0.162***	0.153***	0.272***	0.243***
	(0.044)	(0.043)	(0.065)	(0.064)
Controls	Yes	Yes	Yes	Yes
Adjusted R^2	0.061	0.107	0.083	0.148
Observations	1,079	985	507	468

Exogeneity Test

- Use a test developed by Caetano (2015) and implemented by Caetano et al. (2017).
- Uses the restriction that time spent in an activity is non-negative.
- The group of children that spends 0 minutes in an activity can be divided into two groups.
- The two groups differ in many aspects.
- Children who spend 0 minutes in an activity are discontinuously different from children who spend a small amount of time in that activity.
- If unobservable confounders are not fully absorbed, cognitive development will be discontinuous at zero minutes.

Exogeneity Test Continued

- This discontinuity and hence endogeneity can be detected by:

$$Y_{ia} = T'_{i\{N \times a\}}\alpha_{\{N \times a\}} + CPSB'_{i\{M \times a\}}\beta_{\{M \times a\}} + D'_{i\{N \times 1\}}\gamma_{\{N \times 1\}} + \epsilon_{ia}$$

  where $D'_i := (d_i^1, ..., d_i^N)$, $d_i^n := 1$ when $t_i^n = 0$.

- Test the null hypothesis that $\gamma = 0$ - testing for continuity of production function at $t_i^n = 0$ for all N time inputs jointly.

- Failure to reject the null translates to a failure to reject exogeneity.

- I fail to reject exogeneity for all specifications other than the contemporaneous specification.

Conclusion

- Previous work does not control for educational investment by children.
- Mother's educational time investment is important for cognition.
- In later childhood, educational investment by children alone is more important.
- Estimates do not suffer from endogeneity.
- Autonomous learning can enhance a child's cognitive ability.