



NON-COGNITIVE DEVELOPMENT IN EARLY CHILDHOOD:

THE INFLUENCE OF MATERNAL EMPLOYMENT AND THE MEDIATING ROLE OF CHILDCARE

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Non-Cognitive Skills

agreeableness

neuroticism

extraversion

openness to
experience

conscientiousness





Importance of Non-Cognitive Development

- at least as important as cognitive skills - personal development, academic and labour market success (Heckman & Cunha (2007))
- Inadequate development of these skills during the sensitive period of early childhood may manifest as behavioural problems
- ***Some relevant literature***
 - Heckman & Rubinstein (2001)
 - Heckman & Cunha (2007)
 - Duckworth & Seligman (2005)
 - Duncan & Dunifon (2012)
 - Nagin & Tremblay (1999)
 - Silles (2010)



Evidence from Early Intervention Programmes

- Higher school completion rates
- Fewer teen pregnancies
- Lower levels of criminality
- Higher income
- Lower levels of welfare dependency

15% - 17% rate of return!



Technology of Skill Formation

- Heckman & Cunha (2007)

- the role of early environmental conditions in the evolution of cognitive and non-cognitive skills
- **Capabilities**
 - produced by investments, the environment and genes
 - developmental stages
 - capabilities produced at one stage of lifecycle increase productivity of investments at later stages
 - self-reinforcing and cross-fertilising



What the literature says - maternal employment

The effect of maternal employment on non-cognitive development (del Carmen Huerta et al.,2011)

UK:

- returned to work within 6 months - more likely to experience behavioural problems, though effect sizes are modest

Australia, Canada, United States and Denmark:

- No such pattern

Conclude:

formal childcare participation and parenting activities often have a greater influence on child outcomes



What the literature says - childcare

The first 12 months:

- more behavioural problems (Jacob, 2009; Belsky, 2001; NICHD ECCRN, 2003)
- children cared for by grandparents have higher difficulty scores (Hansen and Hawkes, 2009)

Pre-school (age of 3 or 4)

- Formal centre-based care - better behavioural outcomes (Sylva et al., 2004)

In general

- early enrolment in childcare has a negative impact (Kottelenberg & Lehrer 2014)



Research question

- **Does maternal employment when a child is 9 months (Wave 1) influence the non-cognitive development of a child at age 3 (Wave 2) and, if so, what mediates this influence?**
- **Does the effect vary by socio-economic status?**



Non-Cognitive Development - Measurement

- **Outcome measure: Strengths & Difficulties Score at Age 3 (Wave 2) (“SDQ”, Goodman, 1997)**
- **Overall score: Emotional, Conduct, Hyperactivity, Peer problems**
- **High score (≥ 14) can be predictive of future behavioural issues**

Note: A score of 17 or greater is defined by Goodman (1997) as abnormal or “problematic”, while a score of 14 to 16 is classified as “borderline”. In this study, 4.4% of children can be described as problematic, while a further 7.1% fall within the borderline category.



Methodology

Step 1 Probit Model

Is there an association between problematic behaviour at Age 3 and Maternal Employment at 9 months?

Step 2 Propensity Score Matching (PSM)

Are the Probit results influenced by selection bias?
PSM mimics an experiment.

Step 3 Selection Bias

(Altonji, Elder and Taber, 2005)

Still could have unobservables that cause selection bias.

How large must this selection bias be to invalidate the results?

Step 4 Mediation Analysis

How is the effect of maternal employment on non-cognitive development channelled?



Step 1 – Probit Model

	LOW MATERNAL EDUCATION	HIGH MATERNAL EDUCATION
	Probit (mfx)	Probit (mfx)
Fulltime v Home	0.060** [0.029]	-0.005 [0.013]
Parttime v Home	0.051* [0.027]	-0.008 [0.014]
Full v Part	0.016 [0.024]	-0.003 [0.011]

Covariates:

Full set of baseline controls included in analysis plus maternal and paternal employment at 3 years



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Covariates:

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Step 2 – Matching Model

	LOW MATERNAL EDUCATION	HIGH MATERNAL EDUCATION
	PSM	PSM
Fulltime v Home	0.040*	-0.011
	[0.021]	[0.014]
Parttime v Home	0.017	-0.014
	[0.021]	[0.014]
Full v Part	0.03	0
	[0.020]	[0.011]

Covariates:

Full set of baseline controls included in analysis plus maternal and paternal employment at 3 years



Probit v Matching

	LOW MATERNAL EDUCATION		HIGH MATERNAL EDUCATION	
	Probit (mfx)	PSM	Probit (mfx)	PSM
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	[0.024]	[0.020]	[0.011]	[0.011]

Covariates:

Full set of baseline controls included in analysis plus maternal and paternal employment at 3 years



Step 3 – Mediation Analysis

A variable functions as a mediator to the extent that it accounts for the relationship between a predictor (maternal employment) and a dependent variable (SDQ score) (Baron and Kenny, 1986)

POTENTIAL MEDIATORS	MEDIATOR?
Childcare	YES
Income	NO
Stress	NO
Quality of Mother-Child Attachment	NO



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Step 3 – Mediation Analysis

CHILDCARE BY TYPE	PROBABILITY OF SDQ SCORE ≥ 14 (MFX PROBIT)
	ALL
N	8,852
<i>Childcare at 9 months (base: At home with parent)</i>	
Informal Unpaid	0.03 [0.031]
Informal Paid	-0.03** [0.013]
Grandparent Unpaid	0.03 [0.021]
Grandparent Paid	0 [0.018]
Centre Based Care	-0.02 [0.014]

Note: All baseline controls included plus maternal employment at 9 months and 3 years



Step 3 – Mediation Analysis

CHILDCARE BY TYPE	PROBABILITY OF SDQ SCORE ≥ 14 (MFX PROBIT)	
	ALL	LOW MATERNAL EDUCATION
N	8,852	3,692
<i>Childcare at 9 months (base: At home with parent)</i>		
Informal Unpaid	0.03 [0.031]	0.02 [0.046]
Informal Paid	-0.03** [0.013]	-0.02 [0.029]
Grandparent Unpaid	0.03 [0.021]	0.07* [0.038]
Grandparent Paid	0 [0.018]	0 [0.035]
Centre Based Care	-0.02 [0.014]	0.01 [0.036]

Note: All baseline controls included plus maternal employment at 9 months and 3 years



Step 3 – Mediation Analysis

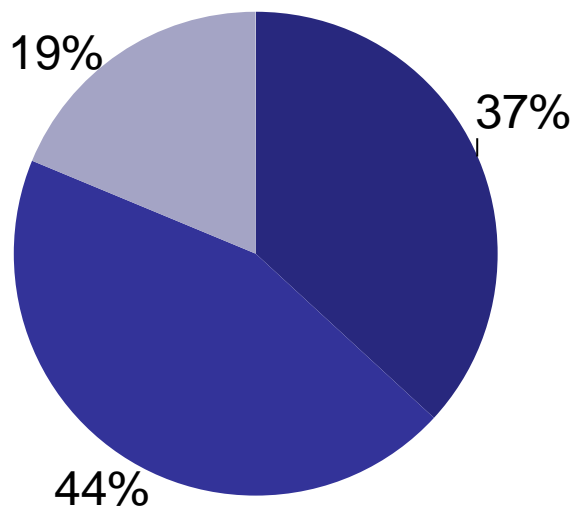
CHILDCARE BY TYPE	PROBABILITY OF SDQ SCORE ≥ 14 (MFX PROBIT)		
	ALL	LOW MATERNAL EDUCATION	HIGH MATERNAL EDUCATION
N	8,852	3,692	5,160
<i>Childcare at 9 months (base: At home with parent)</i>			
Informal Unpaid	0.03 [0.031]	0.02 [0.046]	0.04 [0.045]
Informal Paid	-0.03** [0.013]	-0.02 [0.029]	-0.03*** [0.01]
Grandparent Unpaid	0.03 [0.021]	0.07* [0.038]	0 [0.0167]
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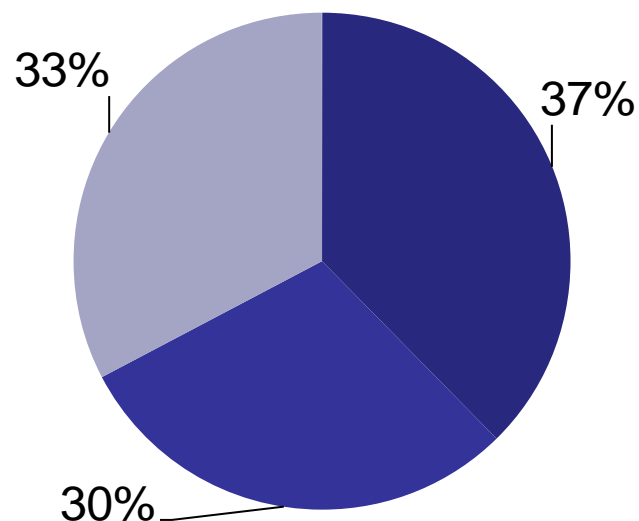
NON-PARENTAL CHILDCARE CHOICE AT 9 MONTHS

LOW MATERNAL EDUCATION*



70% cared for at home by parent*

HIGH MATERNAL EDUCATION**



52% cared for at home by parent**



What about selection bias.....?

- What if mothers who choose to work are different to mothers who choose to remain at home?
- What if this “trait” also influences non-cognitive development in her child?

Propensity Score Matching (PSM) addresses selection bias if

- selection on observables only, or
- unobservables are balanced between working mother’s and mother’s at home, or
- Unobservables do not influence selection into employment



Step 4 – Measurement of Potential Selection Bias

Altonji, Elder and Taber (2005)

How large must the selection bias be to invalidate the results?

Negative bias

- lower bound
- Selection bias is likely to understate the true effect



Findings in context and policy implications

- The effects confined to the less-advantaged
- Childcare choice is the key mediator
- Improved access to quality formal childcare
- Early childhood - sensitive period
- Early intervention programmes - substantial return from investing in early childhood



Contribution of this study

- Adding to international research
- Non-Cognitive v. Cognitive
- Current data – represents today's children
- Methodological strengths – Mediation Analysis & Selection Bias



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