The Labor Market Consequences of Child Developmental Delays: Implications for Maternal Labor Force Participation

Genevieve Jeffrey, LSE

March 19th, 2025

Genevieve Jeffrey, Fellow at LSE Department of Health Policy

No conflict of interest to disclose.

Introduction

- Female labor force participation is significantly influenced by caregiving duties.
- Existing literature establishes that child physical & mental illness reduces maternal employment (Gould 2004; Eriksen et al. 2021; Salkever 1982; Cheung, Kan, and Yang 2021; Amador and Pinilla-Roncancio 2017; Carella et al. 2024).
- This study focuses on how poor child emotional, physical, motor skills, & language development impact maternal labor decisions.
- Builds on Frijters et al. (2009), using child dominant hand as an instrument to address endogeneity.
- Applies the methodology to UK data from the National Child Development Study (NCDS) (University of London 2020).

Policy Relevance

- Child underdevelopment is more widespread than extreme child health shocks studied in previous research.
- Understanding its impact helps design policy interventions for families with underdeveloped children.
- Investigates a rich set of mechanisms through which child underdevelopment affects maternal employment decisions.
- This study examines both:
  - Extensive margin: Whether a mother participates in the labor force.
  - Intensive margin: Number of hours worked & transitions in employment.

Methodology & Key Findings

- Endogeneity problem: Mothers' employment decisions & child underdevelopment may be correlated.
- Instrumental Variable: Child's dominant hand (randomly assigned, linked to neurodevelopment (Johnston et al. 2009)).
- Findings:
  - Mothers of underdeveloped children are more likely to be in part-time work before the child enters school.
  - These mothers work fewer hours & are less likely to transition into full-time employment.
  - Increased likelihood of remaining a stay-at-home mother.
  - Timing: Mothers delay workforce entry until after the child starts school.

Early Contributions to the Literature

- Foundational studies establish a direct link between child disabilities & reduced maternal labor force participation.
- Salkever (1982): Highlights the barriers to employment caused by increased caregiving costs.
- Porterfield (2002): Shows single mothers face greater employment constraints due to limited support.
- Gould (2004): Differentiates between:
  - Time-intensive caregiving, which reduces labor supply.
  - Financial caregiving costs, which may incentivize employment to compensate for expenses.

Empirical Findings on Maternal Employment

- Studies confirm that caregiving disproportionately affects maternal employment decisions.
- Eriksen et al. (2021) (Denmark): Chronic child health issues lead to wage penalties & employment interruptions lasting up to 10 years.
- Cheung, Kan, and Yang (2021) (Taiwan) & Carella et al. (2024) (Argentina): Similar long-term labor force constraints for mothers of children with disabilities.
- Contrasting Evidence:
  - Amador and Pinilla-Roncancio (2017): Finds higher maternal labor force participation in response to child disability.
  - Effect mainly driven by single mothers, while married mothers in full-time work reduce participation.

Handedness as an Instrument

- Handedness has been linked to cognitive, physical, & emotional outcomes in children.
- Three primary pathways explain this relationship:
  1. Neurodevelopmental variations
  2. Prenatal & perinatal factors
  3. Observed developmental disparities
- This study examines these links while controlling for sex & birthweight for gestational age to address baseline health differences.

Neurodevelopmental & Prenatal Factors

Neurodevelopmental Variations:

- Atypical cerebral lateralization in left-handed/mixed-handed children linked to language delays & weaker executive function (Johnston et al. 2009).
- Differences in brain organization may contribute to developmental disparities.
- This study controls for birthweight & gestational age to isolate neurological risks.

Prenatal & Perinatal Factors:

- Geschwind-Behan-Galaburda hypothesis: Elevated prenatal testosterone may influence both handedness & immune function, affecting development (Galaburda and Geschwind 1987).
- Left-handedness linked to birth complications, low birthweight, & perinatal stress (Bakan, Dibb, and Reed 1973; Fox 1985).
- This study incorporates birthweight & sex controls to refine these relationships.

Developmental Disparities & Study Contribution

Observed Developmental Disparities:

- Left-handed/mixed-handed children perform worse in language, motor skills, & cognitive assessments (Johnston et al. 2009; Bryden, Bruyn, and Fletcher 2005).
- Socioeconomic factors do not fully explain these differences (Johnston et al. 2009).
- This study tracks longitudinal data to assess whether disparities persist through early schooling.

Study Contribution:

- Disentangles the effects of handedness from perinatal & early-life health influences.
- Ensures findings are not confounded by baseline health disparities.
- Highlights the need for early intervention strategies for left-handed/mixed-handed children.

Standardized Developmental Domains by Handedness

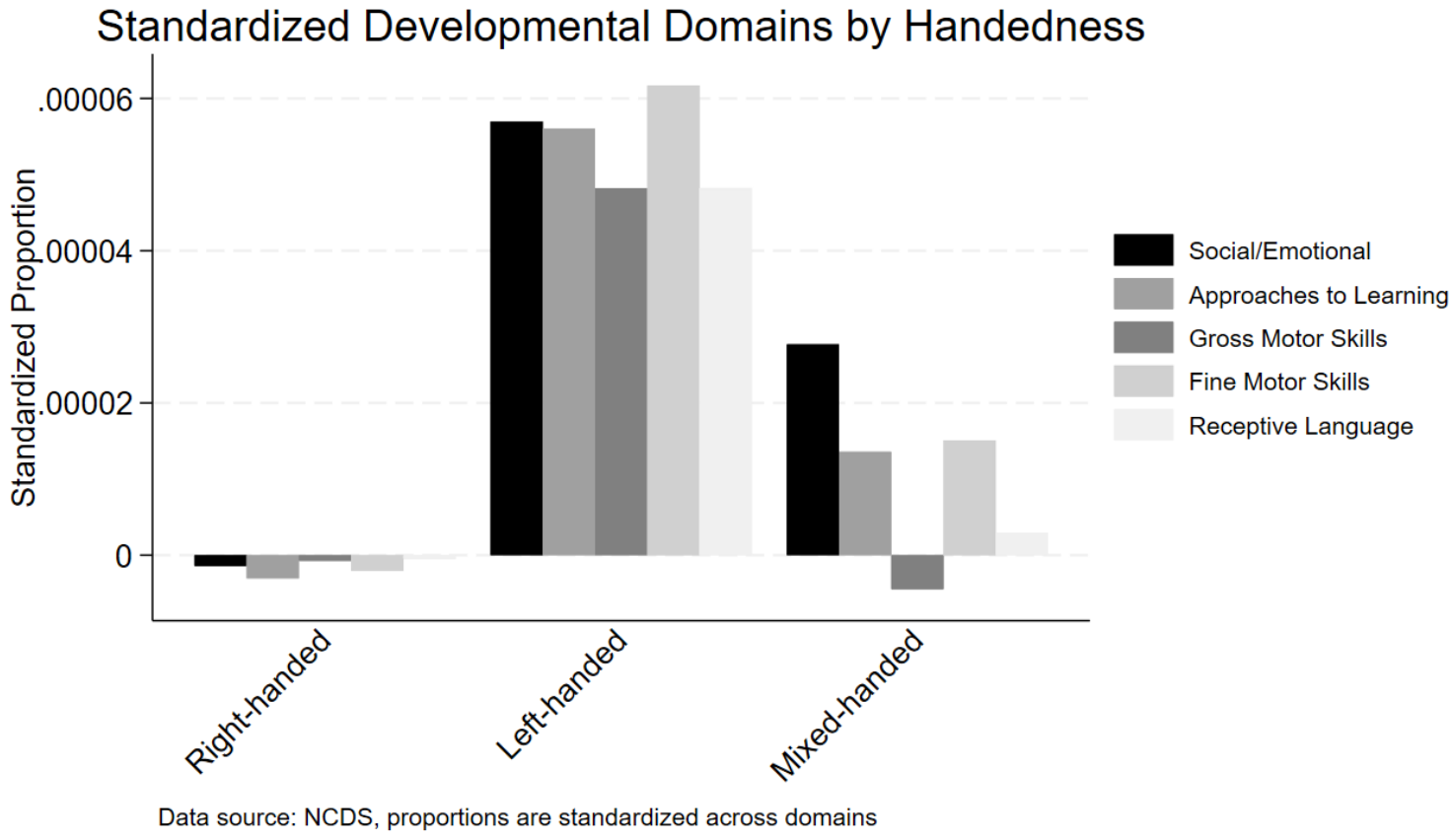


Figure: Standardized Developmental Domains by Handedness

Key Findings & Interpretation

- The graph illustrates standardized proportions of developmental delays across five key domains:
  1. Social/Emotional Development
  2. Approaches to Learning
  3. Gross Motor Skills
  4. Fine Motor Skills
  5. Receptive Language
- Left-handed & mixed-handed children show higher proportions of delays across most domains.
- Right-handed children serve as the baseline group, exhibiting consistently lower standardized proportions of delays.

Key Findings & Interpretation

- Left-handed children exhibit the highest delays, particularly in:
  - Gross motor skills
  - Receptive language
- Mixed-handed children show intermediate delays, aligning with the idea that the neurological effects of handedness vary in intensity.
- Right-handed children have the lowest developmental delays, reinforcing their role as the reference group.
- The most significant disparities appear in receptive language & gross motor skills, suggesting handedness as a potential predictor of developmental challenges.
- These findings provide insights into child development variations & underscore the role of neurological & cognitive differences linked to handedness.

Data: National Child Development Study (NCDS)

- Dataset: National Child Development Study (NCDS) (University of London 2020)
- Cohort Study: Tracks 17,415 individuals born in a single week (March 3-9, 1958) across England, Scotland, & Wales.
- Study Waves Used:
  - Perinatal survey (at birth)
  - Follow-up waves at ages 7, 11, & 16.
- Key Features for This Study:
  - Handedness measures (mother's perspective, laterality tests, hand dominance for tasks).
  - Child development assessments (motor skills, emotional & learning development, health).
  - Maternal employment data (allows analysis of both extensive & intensive labor force participation).
- Previous Research: Denny and O'Sullivan (2007) found long-run handedness effects on earnings (positive for males, negative for females).

Laterality as an Instrument

- Handedness is used as an instrumental variable (IV) to address endogeneity between child underdevelopment & maternal labor force participation.
- Previous studies, such as Frijters et al. (2009), demonstrate that left-handedness & mixed-handedness are correlated with child underdevelopment.
- Handedness provides exogenous variation, serving as a natural experiment to isolate the causal impact of child development on maternal labor supply.
- Johnston et al. (2009) identify handedness as a robust predictor of early child development, reinforcing its validity as an IV.
- This study leverages these insights to explore the causal relationship between child development & maternal employment outcomes.

Introduction

- This study examines the impact of child underdevelopment on maternal labor force participation.
- The primary research question: **How does child development affect maternal employment decisions?**
- To address endogeneity, an instrumental variable (IV) approach is applied using child handedness.
- A decomposition analysis further identifies time-intensive, financially intensive, & unpredictable caregiving demands.

Introduction

- Examines how maternal labor force participation (MLFP) responds to child underdevelopment.
- Key transitions explored:
  - From part-time work to full-time or non-employment.
  - From full-time work to part-time or non-employment.
  - Entry into employment from non-employment.

Introduction

Core Research Question:

- How do child developmental delays impact maternal labor force participation (MLFP)?
- Focus on emotional, motor skills, learning, & language development.

Methodological Innovation:

- Uses **handedness (left or mixed-handedness)** as an instrument.
- Addresses endogeneity in child development & maternal employment decisions.

Data & Key Contributions

Dataset: National Child Development Study (NCDS, UK)
Contributions:

- Examines both **extensive** (whether a mother works) & **intensive** (full-time vs. part-time) MLFP margins.
- Studies **employment transitions** before & after school entry.
- Uses a **more comprehensive** measure of child underdevelopment.

Handedness as an Instrument

Rationale:

- Handedness is largely **exogenous** (not influenced by social/economic factors).
- Left-handed & mixed-handed children have different **brain organization**, linked to developmental delays.

Validity:

- Strong correlation with child underdevelopment.
- No pre-birth relationship with maternal employment.

Prenatal & Perinatal Factors

- Factors influencing both handedness & development:
  - Elevated testosterone exposure.
  - Birth complications, stress, & low birth weight.
- Controls included in analysis to account for these effects.

Data & Measures

Child Development:

- Social/emotional, learning, motor skills, & language delays.
- Measured at age 7 & 11.

Maternal Employment:

- Whether employed (extensive margin).
- Full-time vs. part-time work (intensive margin).
- Transitions before & after school entry.

Methodology

Instrumental Variables (IV) Approach:

- Uses **handedness** to predict child underdevelopment.
- Second stage estimates MLFP effects.

Assumptions:

- Handedness is **randomly assigned**.
- No direct impact on maternal labor force participation.

Key Findings

- OLS models overestimate the effect of child underdevelopment on MLFP.
- IV results: No strong effect on full-time work but significant negative effect on part-time work.
- Mothers of underdeveloped children are less likely to participate in the workforce before school entry.

Employment Transitions

- No increase in part-time to full-time transitions.
- Higher likelihood of remaining in part-time work.
- Lower likelihood of entering full-time work.

Mechanisms

Why does child underdevelopment reduce MLFP?

- Increased **financial strain** due to additional costs.
- Reduced **maternal time away from home** for caregiving.
- Higher likelihood of child emotional distress (e.g., "miserable or tearful").

Robustness & Sensitivity

- Results hold across different measures of child development.
- Anderson-Rubin p-value confirms **validity of IV estimates**.
- Results remain consistent using **alternative laterality measures**.

Policy Implications

- Flexible work policies for mothers with children facing developmental challenges.
- Increased access to early intervention & childcare support.
- Future research should explore long-term earnings effects for mothers.

Preview of Results

- Child developmental delays significantly reduce maternal labor force participation, especially in part-time roles.
- Effects are strongest before school entry.
- Policy measures should target mothers of underdeveloped children to improve labor market outcomes.

Data Source: National Child Development Study (NCDS)

- Tracks **17,415 individuals** born in a single week in 1958 across the UK.
- Data collected at birth, ages 7, 11, & 16.
- Contains:
  - Child's **handedness, motor skills, emotional & learning development**.
  - Multiple measures of **maternal employment decisions**.

Key Variables in the Study

- Handedness:
  - Primary instrument: **Maternal reports of handedness at age 7**.
  - Alternative measures: Reports at age 11 & self-reports at age 16.
- Child Developmental Delays:
  - Composite measure spanning five domains:
    - Social/emotional, learning, gross motor, fine motor, receptive language.
  - Additional indicators: Educational support needs, percentile thresholds.
- Maternal Employment:
  - Binary indicator: Whether mother is employed (extensive margin).
  - Employment intensity: Full-time vs. part-time work (intensive margin).
  - Transitions: Before & after child attends school.

Child Development Measures

Key Variables:

- **Social/Emotional Development**: Squirmy behavior, emotional difficulties.
- **Approaches to Learning**: Poor test performance, reading ability.
- **Gross Motor Skills**: Clumsiness when climbing stairs, running, walking.
- **Fine Motor Skills**: Poor hand control, coordination.
- **Receptive Language**: Speech difficulties, stuttering.

Measurement Techniques:

- Teacher assessments, parental reports, medical evaluations.
- Factor analysis to create composite scores.

Maternal Labor Force Participation (MLFP)

- **Employment Status:**
  - Binary measure: Whether a mother is engaged in paid work.
  - Differentiates between full-time & part-time employment.
- **Transitions in Employment:**
  - Before & after school entry.
  - Transitions between part-time & full-time work.
  - Transitions in & out of the labor force.
- **Time Allocation:**
  - Measures of total hours worked.
  - Hours spent away from home.

Control Variables

Child Characteristics:

- Gender, birthweight.

Socioeconomic Factors:

- Household socioeconomic status.

Family Background:

- Birth order, total number of births, multiple births.

Maternal Factors:

- Age, education, marital status, medication during pregnancy, chronic conditions.

Early Development Controls:

- Walking independently by 1.5 years, speaking by age 2.

Statistical Methods

- **Ordinary Least Squares (OLS):** Baseline associations.
- **Instrumental Variables (IV):** Handedness as an instrument.
- **IV Probit:** To account for binary employment decisions.
- **First-stage regressions:** Validate strength of instrument.
- **Reduced form estimation:** Examines relationship between handedness & maternal employment.
- **Kolmogorov-Smirnov (K-S) test:** Tests monotonicity assumption.

Addressing Endogeneity: IV Approach

First Stage: Predicting Child Underdevelopment

$$D_i = \gamma' X_i + \pi H_i + \nu_i \tag{1}$$

where:

- H_i = Handedness indicator (1 = left/mixed-handed, 0 = right-handed).
- π = Relationship between handedness & developmental outcomes.

Second Stage: Estimating Maternal Labor Force Participation

$$L_i = \beta' X_i + \alpha \hat{D}_i + \eta_i \tag{2}$$

IV Probit Model: Since L_i is binary, an IV probit model is employed for efficiency.

Decomposing the Impact of Child Development

Inspired by Gould (2004), this study further decomposes the impact into three key components:

- **Time-intensive caregiving** (motor/cognitive delays reduce work hours).
- **Financially intensive caregiving** (increased expenses incentivize more work).
- **Unpredictable caregiving** (behavioral/emotional delays disrupt stable employment).

Model Specification:

$$L_i = \beta' X_i + \alpha_1 T_i + \alpha_2 F_i + \alpha_3 U_i + \epsilon_i \tag{3}$$

where:

- T_i = Time-intensive caregiving.
- F_i = Financially intensive caregiving.
- U_i = Unpredictable caregiving.

Results: Overview

- This section examines the impact of child underdevelopment on maternal labor force participation.
- Four key outcomes are studied:
  - Full-time employment
  - Part-time employment
  - Whether the mother works at all
  - Hours worked
- Various estimation methods are used:
  - OLS
  - Reduced form estimation
  - Two-stage least squares (IV 2SLS)
  - IV Probit
- The results shed light on both extensive & intensive margins of maternal labor force participation.

Model Specification

Main Model:

$$L_i = \beta' X_i + \alpha D_i + \epsilon_i \tag{4}$$

where:

- L_i = Maternal labor force participation (1 = employed, 0 = not employed).
- D_i = Child underdevelopment.
- X_i = Control variables (maternal, child, & household characteristics).
- ϵ_i = Error term.

Key Parameter: α captures the causal effect of child underdevelopment on maternal employment.

Addressing Endogeneity: IV Approach

First Stage: Predicting Child Underdevelopment

$$D_i = \gamma' X_i + \pi H_i + \nu_i \tag{5}$$

where:

- H_i = Handedness indicator (1 = left/mixed-handed, 0 = right-handed).
- π = Relationship between handedness & developmental outcomes.

Second Stage: Estimating Maternal Labor Force Participation

$$L_i = \beta' X_i + \alpha \hat{D}_i + \eta_i \tag{6}$$

IV Probit Model: Since L_i is binary, an IV probit model is used for efficiency.

Impact on Full-Time Employment

- OLS Results:A positive & statistically significant relationship between child underdevelopment & full-time employment.
  - A mother is 0.003 percentage points more likely to work full-time if the child is underdeveloped.
  - Significant at 1% level.
- IV Estimates:
  - The IV 2SLS & IV Probit estimates are positive but not statistically significant
  - This suggests that while the OLS estimates indicate a strong relationship, endogeneity may be driving the results
- Interpretation:
  - OLS may capture confounding factors like family income or stress
  - The IV approach weakens the effect, implying that full-time employment responses to child underdevelopment are limited.

Impact on Part-Time Employment

- OLS Results:
  - Child underdevelopment is positively associated with part-time work, but the effect is not significant.
- IV Estimates:
  - Reduced form:Left-handed or ambidextrous children are associated with a 0.022 percentage point reduction in maternal part-time employment (significant at 5%).
  - 2SLS: Child underdevelopment leads to a 0.082 percentage point reduction in part-time work (significant at 10%).
  - IV Probit: A stronger effect, coefficient is -0.214 , is highly significant (1% level).
- Key Takeaway:
  - Unlike full-time employment, child underdevelopment reduces part-time work participation
  - Suggests caregiving burdens create barriers to flexible work arrangements.

Likelihood of Maternal Employment

- OLS Results: Positive & significant at 5% level
- IV Estimates: All results show negative effects but are not statistically significant
- Implication:
  - While the OLS suggests that mothers are more likely to work overall , instrumental variable results show no strong effect
  - Highlights the importance of distinguishing between full-time & part-time employment

Impact on Hours Worked

- OLS Results: Child underdevelopment is positively associated with hours worked, but not significant.
- IV Probit Results: A statistically significant 0.230-hour reduction in hours worked (5% level).
- Interpretation:
  - Suggests that mothers who remain employed work fewer hours if their child has developmental challenges.
  - Highlights the importance of intensive margin effects , not just participation decisions.

Comparison with Existing Literature

- Consistent with prior findings on child health & maternal labor supply.
- Aligns with Frijters et al. (2009):
  - Confirms reductions in part-time work.
  - No strong effect on full-time work.
- Key distinctions:
  - This study measures child underdevelopment at later ages (7-11), while prior work focused on ages 4-5.
  - Longer-term labor force decisions are considered.

Conclusion

Key Takeaways:

- Child underdevelopment does not significantly affect full-time work but reduces part-time participation
- IV estimates suggest that caregiving demands lower maternal labor supply.
- Mothers with underdeveloped children tend to work fewer hours when employed.

Future Research:

- Explore longer-term labor market effects of child underdevelopment.
- Examine the role of childcare availability in mitigating labor supply reductions.

Overview

- This section examines maternal labor force participation (MLFP) before & after school entry.
- Key questions:
  - Does child underdevelopment affect MLFP before vs. after school entry?
  - How do employment transitions vary (full-time, part-time, or non-employment)?
- Various estimation methods:
  - OLS
  - Reduced Form
  - IV 2SLS
  - IV Probit

Model Specification

Main Model:

$$L_i = \beta' X_i + \alpha D_i + \epsilon_i \tag{7}$$

where:

- L_i = MLFP (1 = employed, 0 = not employed).
- D_i = Child underdevelopment.
- X_i = Control variables (maternal, child, household).
- ϵ_i = Error term.

Key Parameter: α captures the causal effect of child underdevelopment on MLFP.

MLFP Before & After School Entry

Mothers Work Type: Before & Since Child is at School: Part-Time Work & Full-Time Work																
	MLFP Full-Time Post-School Start				MLFP Part-Time Post-School Start				MLFP Part-Time Before-School Start				MLFP Full-Time Before-School Start			
VARIABLES	OLS	Reduced Form	IV 2SLS	IV Probit	OLS	Reduced Form	IV 2SLS	IV Probit	OLS	Reduced Form	IV 2SLS	IV Probit	OLS	Reduced Form	IV 2SLS	IV Probit
Child Underdevelopment	0.001		-0.012	-0.095	0.004		-0.012	-0.032	0.000		-0.092*	-0.235*	0.003*		0.007	0.026
	(0.001)		(0.026)	(0.150)	(0.002)		(0.043)	(0.119)	(0.001)		(0.049)	(0.062)	(0.001)		(0.027)	(0.187)
Left Handed or Ambidextrous		-0.003				-0.003				-0.023				0.002		
		(0.007)				(0.011)				(0.010)				(0.007)		
Observations	10,413	10,159	10,159	10,148	10,413	10,159	10,159	10,159	10,143	9,898	9,898	9,898	10,143	9,898	9,898	9,898
R-squared	0.025	0.025	0.008		0.046	0.045	0.036		0.018	0.019	-0.446		0.038	0.035	0.035	
Mean of Dep. Var.	0.0907	0.0901	0.0901	0.0902	0.354	0.353	0.353	0.353	0.209	0.209	0.209	0.209	0.0835	0.0819	0.0819	0.0819
F test			11.80				11.80				10.09				10.09	
AR p-value			0.650				0.782				0.0196				0.803	