Family Size Effects on Child Health: Evidence on the Quantity-Quality Trade-off using the NLSY

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Outline

Research Summary

Research Motivation

- The Quantity-Quality trade-off (QQ) theory predicts a negative relationship between family size and child quality.
- Family size literature has focussed mainly on children's cognitive development.
- Lack of research with respect to child health outcomes of changes in family size.
- The study focuses on family size effects on important child health outcomes.

Research Summary

Analysis and Conclusion

- The study uses body weight indicators as the main outcomes of interest.
- **Data**: NLSY79 (mother's cohort) matched with NLSY CYA (Child and Young Adult surveys).
- **Identification**: Instrumental variable regression (supported by multiple robustness checks) & panel data analysis using child fixed effects.
- **Key finding**: The study does not find strong evidence in support of the QQ theory.

Research Summary

Main Contributions

- First study to systematically analyze the effects of child health using a US-based sample.
- The study looks at multiple health and behavioral outcomes to explain the underlying mechanism of the observed impacts.
- Policy implications - Increase in family size has a negative relationship with chances of being overweight (obese), but in some cases, may also lead to an increase in the likelihood of being underweight.

Family Size and Child Quality

- The QQ theory was first proposed by Becker and his co-authors (**Becker 1960; Willis 1973; Becker & Tomes 1973; Becker & Lewis 1976**).
- Given fixed level of parental resources (time, money, care), exogenous increases in family size lead to an increase in the shadow price of child quality.
- Examples of empirical studies on the QQ theory- **Rosenzweig & Wolpin 1980, Blake 1981, Hanushek 1992, Black, Devereux, & Salvanes 2005, Caceres-Delpiano 2006, Angrist, Lavy, & Schlosser 2010, De Haan 2010**.
- Shortage of research and lack of consensus among researchers with respect to family size-child health relationship.
- **Rosenzweig & Zhang 2009, Millimet & Wang 2009; Lundborg, Ralsmark, & Rooth 2015; Peters, Rees, & Rey 2015; Zhong 2016**.
- Commonly used IV - Exogenous variations in family size are generated by *twin births* and parental preference for a *mixed sex composition* of their children.

Child Health & Family Size

Two existing theories:

- Considering child health is a function of parental resources and market based health inputs, the QQ theory would imply that a there is an inverse relationship between family size and child health.
- The Hygiene Theory - Children in larger families are likely to experience early exposure to various diseases that develops future immune system (**Strachan 1989**).
  - Edwards & Grossman 1983; Kruger et al. 2006 - Talk about obesity.
  - Jenson & Ahlburg 2002; Ponsonby et al. 1998; Rona et al. 1997; Strachan 1989; 1997 - Talk about other diseases.

Measures of Health Outcome

- Child's body weight is an important health indicator.
- Obesity is associated with long term health implications including diabetes, heart diseases, hypertension, and cancer.
- Underweight increases risk of mortality and affects cognitive development.
- Economic hardships and food insecurity may place children at the risk of having extreme body weight outcomes.
- Childhood obesity is more prevalent in the US compared to childhood underweight (16.9 % Vs 3.5%, NHANES, 2012-2013).

The National Longitudinal Surveys

- Child information are obtained from the biennial Child and Young Adult Surveys (NLSY CYA, 1986-2012)
- NLSY CYA are based on a total 11,511 children belonging to 4,931 mothers from the original cohort of the National Longitudinal Surveys of Youth (1979).
- The mother-child dataset is created by matching mothers' information with their children's information.
- The analysis focuses on children aged between 2 and 17.

NLSY Information

- Dependent variables are child BMI and binary indicators for whether a child is overweight, obese, underweight (and of healthy weight) (CDC, 2000).
- The explanatory variable is the number of household member aged under 18.
- Controls:
  - Child: Age, birthweight, sex, race, and birthorder.
  - Mother: AFQT scores, Rotter Scale, Highest grade completed, and BMI.
  - Family: Net total income (real terms) and HOME-SF raw score.
- Additional child health and behavioral outcomes include sibling relationships, hours of watching TV during weekdays, and incidence of illness that requires medical attention.

Empirical Strategy- Cross-sectional Analysis

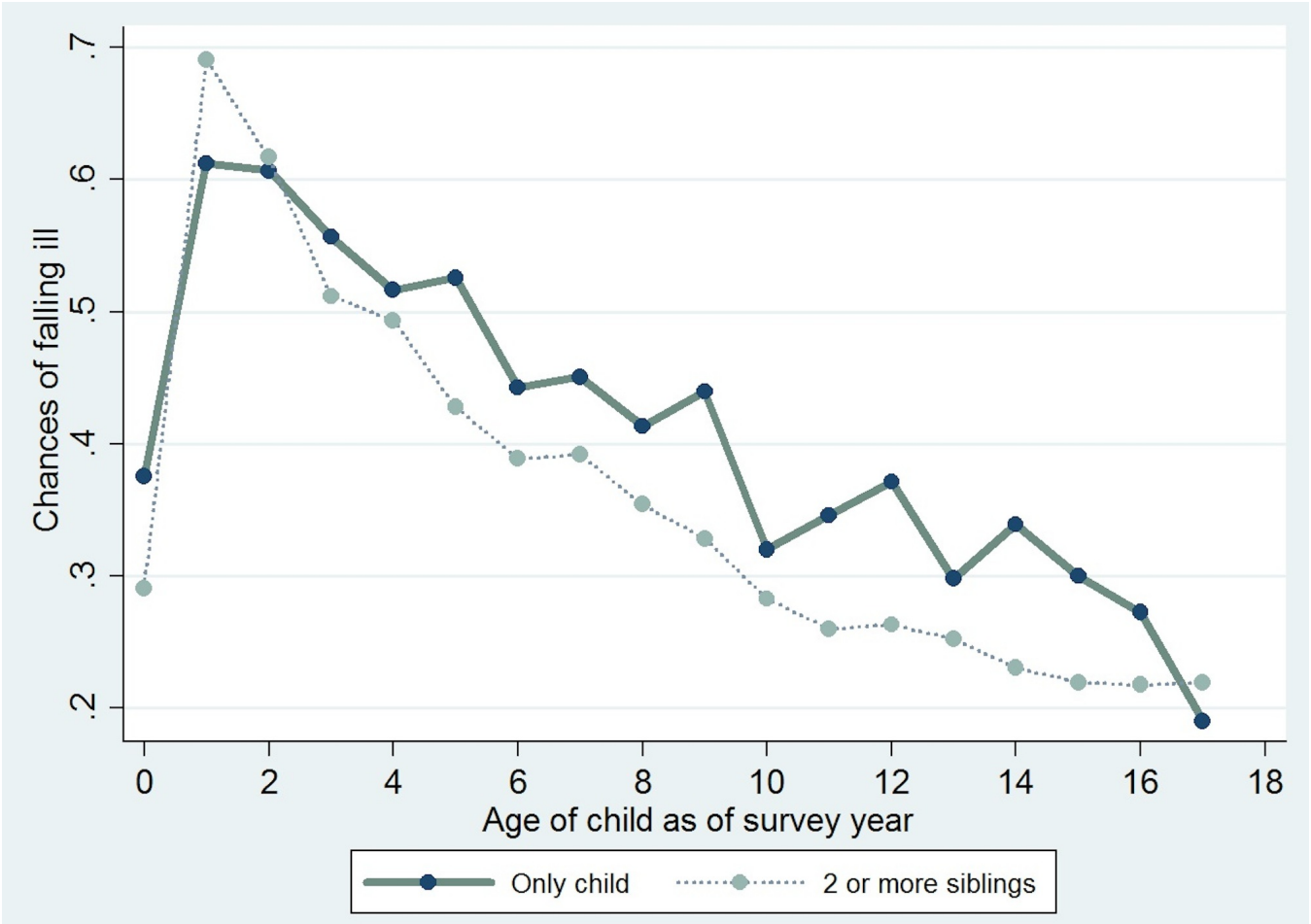
- We perform probit (OLS) regressions for binary (continuous) health indicators.
- For the IV regression analysis, we estimate:

$$Y_{it} = \beta_0 + \beta_1(\widehat{HHsize_{it}}) + X_{it}\beta_2 + \epsilon_{it} \qquad (1)$$

$$HHsize_{it} = \alpha_0 + \alpha_1 Z_{it} + X_{it}\alpha_2 + \upsilon_{it} \qquad (2)$$

- β_1 estimates the family size impact on child health outcomes measured by Y_{it}.
- Equation (2)- The first-stage of the IV regressions, where Z_{it} is our instrumental variable.
  - Twin IV - Z_{it} is a binary indicator that equals 1 if there is a twin in the family.
  - Same-sex siblings IV- Z_{it} is a binary indicator that equals l if a family's first two children are of the same sex.

Household size and Illness- What the data suggests



IV regression analysis

- Unrestricted sample (UR): Child resides with mother.
- Restricted sample (R): Child resides with both parents.

Table: Household size effects on child body weight

Dependent Variable	BMI		Overweight		Obese		Underweight		Healthy weight	
Estimation	UR	R	UR	R	UR	R	UR	R	UR	R
OLS/ Probit	-0.210*	-0.234**	-0.012**	-0.015**	-0.013***	-0.017***	0.002	0.003	0.013**	0.016**
	(0.057)	(0.081)	(0.005)	(0.007)	(0.004)	(0.005)	(0.003)	(0.005)	(0.005)	(0.007)
N (UR=11733) (R=7193)										
Twin IV	0.444	-0.344	0.064	-0.037	0.017	-0.042	-0.031	0.041	-0.037	-0.002
	(0.344)	(0.649)	(0.041)	(0.069)	(0.042)	(0.051)	(0.034)	(0.062)	(0.044)	(0.083)
N (UR=11280) (R=6915)										
Sex-ratio IV	-0.642	0.206	-0.177	-0.183	-0.101	-0.082	0.114	-0.002	0.068	0.177
	(1.534)	(1.843)	(0.112)	(0139)	(0.117)	(0.135)	(0.093)	(0.108)	(0.139)	(0.135)
N (UR=3485) (R=2279)										

Additional Outcomes

Table: Household size effects on additional outcomes

Probit / OLS		Twin IV		Same sex IV	
UR	R	UR	R	UR	R
Sibling relationship					
0.018**	0.048***	0.146***	0.275***	0.526**	0.545**
(0.008)	(0.010)	(0.049)	(0.097)	(0.239)	(0.235)
11673	7051	11278	6834	3591	2265
TV viewing					
-0.017*	-0.035**	-0.050	-0.094	-0.361	-0.287
(0.009)	(0.013)	(0.066)	(0.157)	(0.297)	(0.270)
8964	4726	8150	4320	2711	1502
Medical Illness					
-0.029***	-0.030***	0.030	0.097	0.053	0.102
(0.004)	(0.006)	(0.037)	(0.090)	(0.127)	(0.133)
18544	11549	17840	11115	5678	3810

Main findings - Cross-sectional Analysis

- OLS/ Probit estimates suggest that increase in household size by an additional member improves child health outcomes.
- We do not find any significant health effects of household size in the IV regressions.
- Consistent with some previous studies, we do not find evidence of a QQ trade-off.
- Increase in sibling size is likely to be associated with positive health externalities.

Potential Empirical Concerns & Panel Regression

- Exclusion restriction assumption may not be valid - Close birth spacing (twin IV) and economies of scale (Sex-ratio IV).
- Sample selection issues - Effects of family size variations in large families may differ from size changes in smaller families.
- Household size is a broader definition of family size.
- As a further robustness check, we perform panel regression analysis controlling for unobserved child fixed effects that may bias the causal estimates of family size effects.
- To accurately measure the effects of changes in family size, we look at the effect of birth of a younger sibling on health outcomes of older siblings.

Fixed Effects Regression Model

- Health effects of birth of a younger sibling -
$$Y_{ijt} = \gamma_0 + \gamma_1 1.\{after\}_{ijt} + X_{ijt}\gamma_2 + a_i + u_{ijt} \qquad (3)$$

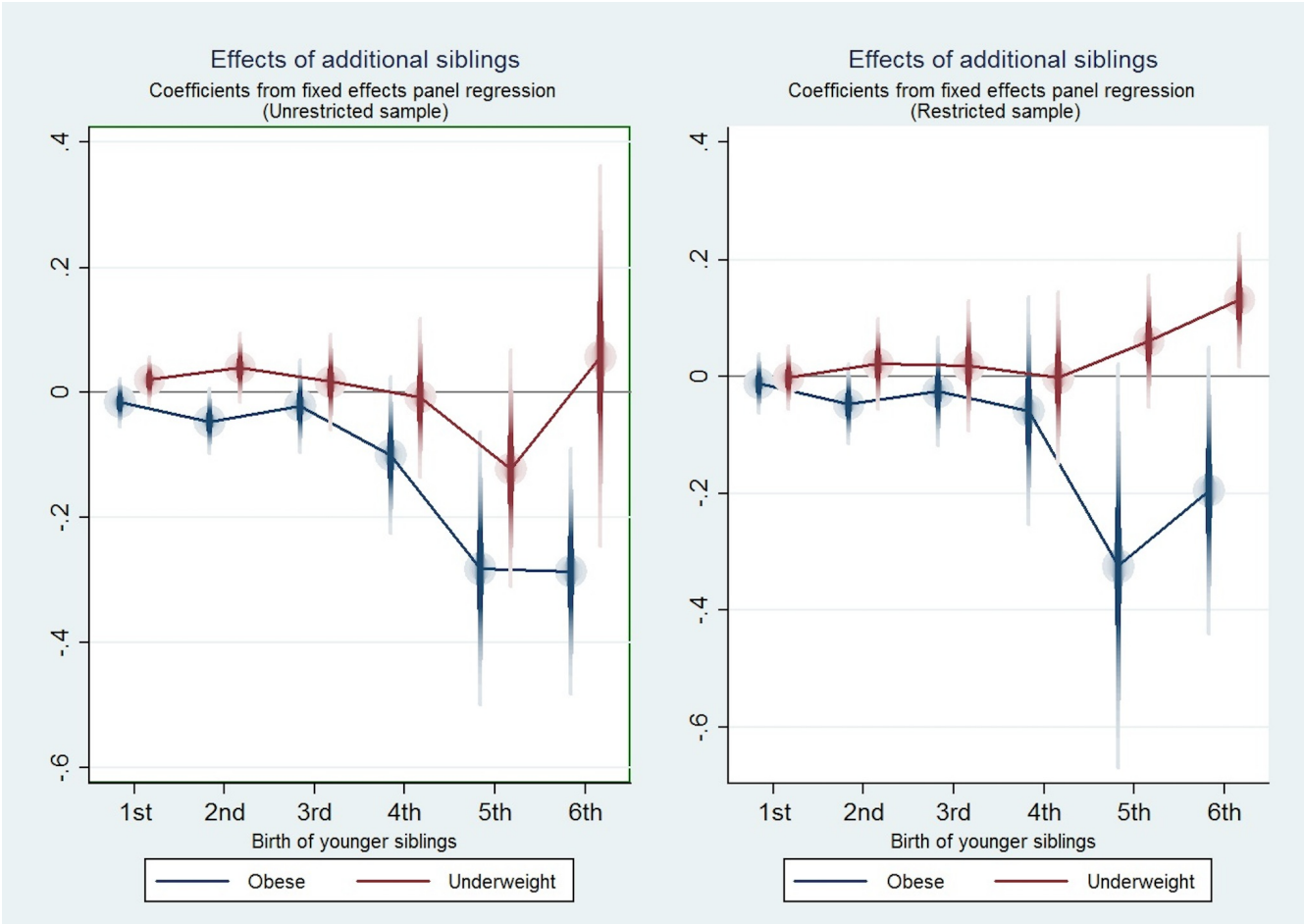
- Variations in health outcomes across successive births of younger siblings -
$$Y_{ijt} = \rho_0 + \sum_{j=i+1}^{N} \mu_j 1.\{after\}_{ijt} + X_{ijt}\rho_2 + a_i + e_{ijt} \qquad (4)$$

Panel Analysis - Equation (3) estimates

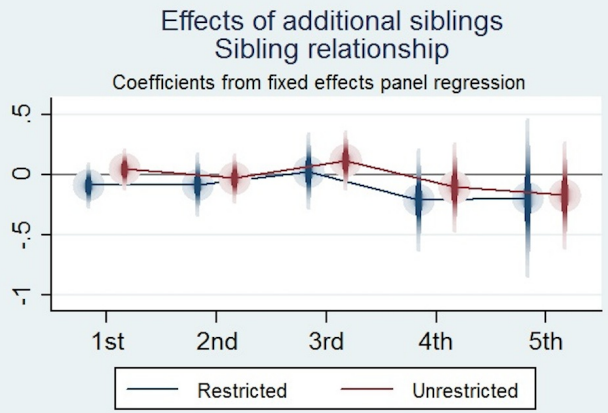
Table: Fixed effects estimates of family size variations

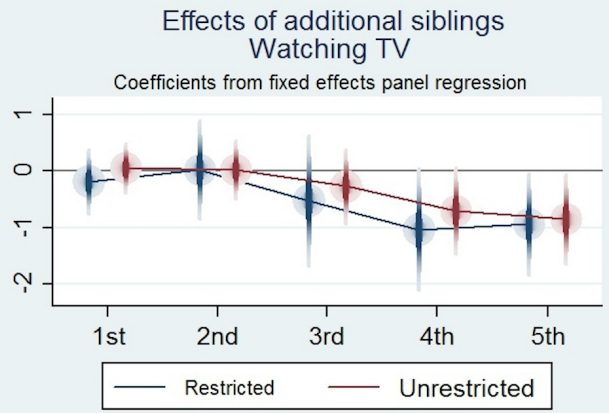
	BMI	Overweight	Obese	Underweight
Unrestricted Sample (N=17264)				
Birth of a younger sibling	-0.344*** (0.114)	-0.021** (0.009)	-0.020** (0.008)	0.012** (0.006)
-Short-term (0-3 years)	-0.276** (0.140)	-0.014* (0.011)	-0.018** (0.009)	0.013 (0.009)
-Long-term (3+ years)	-0.385*** (0.126)	-0.027** (0.011)	-0.021** (0.009)	0.012* (0.006)
Restricted Sample (N =10359)				
Birth of a younger sibling	-0.289* (0.157)	-0.026** (0.012)	-0.025** (0.010)	0.006 (0.008)
-Short-term (0-3 years)	-0.275 (0.183)	-0.020 (0.013)	-0.020** (0.010)	0.006 (0.011)
-Long-term (3+ years)	-0.301* (0.183)	-0.032** (0.014)	-0.028** (0.011)	0.005 (0.008)

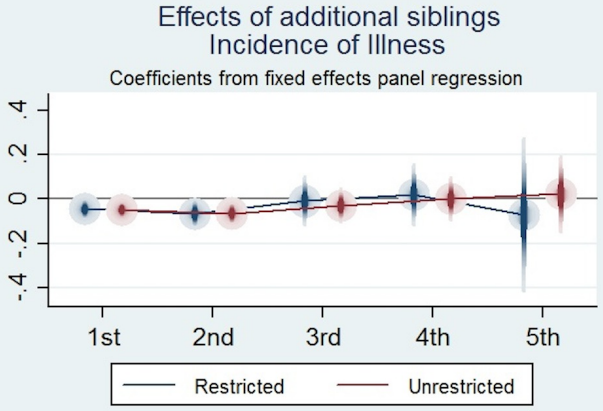
Family Size Effects Across Successive Births - Body weight



Additional Child Outcomes - Fixed Effects Analysis







Results-Summary

- Increase in family size by an additional child reduces the likelihood of obesity for older siblings.
- However, increase in family size may also lead to an increase in the probabibility of being underweight.
- Birth of younger siblings (at lower parities) may lead to a decrease in the probability of falling ill (Hygiene theory) and lowers the frequency of watching TV during weekdays at higher parities.

Concluding Remarks

- Child quantity may not affect child health as increase in shadow price of parental investments are likely to be offset by positive health externalities in large sibship size.
- This study is an important empirical contribution to family and child health literature.
- Results from this study have important policy implications.
- Parental investments are not only determined by child quantity but may also depend on parental priorities regarding child development.
- In the presence of resource constraints, child health may be more important to parents than child's cognitive development.

Thank You!!

Thank you very much for your time!!