Roles of Caregivers' Risk and Time Preferences in Parental Investment and Expectation for Early Childhood and Young Children

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Preliminary and Comments are Welcome

Rationale

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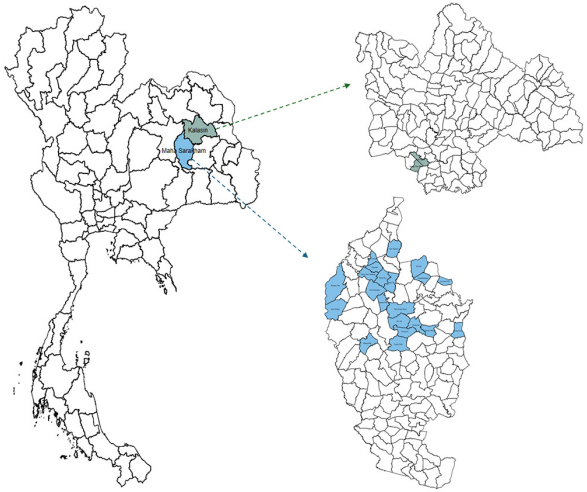
- Early parental investment and parental expectation are key to human capital accumulation (e.g., Knudsen, 2004; Knudsen et al., 2006; Heckman, 2006; Cunha and Heckman, 2008; Del Boca et al., 2014; Boneva and Rauh, 2018; Attanasio et al., 2020, 2022)
- The literature investigating the relationship between parents' or caregivers' preferences and their investment in their young children is limited, with Checchi et al. (2014), Tabetando (2019), and Cuna et al. (2025) being exceptions
- This paper examines the relationship between caregivers' risk and time preferences and their influence on parental investment and expectations using an ongoing early childhood panel data
  - eliciting preferences using incentivized tasks
  - jointly estimating risk and time preferences
  - addressing an error-in-variable problem using IVs

RIECE Panel Data (RPD)

This paper uses early childhood panel data from rural Thailand, called RIECE Panel Data (RPD)

- The survey, which started in June 2016, covers 21 sub-districts or Tambons in Mahasarakham province and two sub-districts in Kalasin province (a sub-district covers between 8 and 24 villages)



To RPD Sample

RIECE Panel Data (RPD)

- The RIECE Panel Data (RPD) has rich information about household, children, and school information
  - We use per capita consumption for each individual, averaging over 2017-2021, to estimate preference parameters
- This paper utilizes the data from lab-in-the-field experiments to measure time and risk preferences using two incentivized tasks in 2019 and 2021, respectively
  - 929 caregivers from 929 households were elicited time preferences during June to October 2019: using two sets of tasks
  - 1,270 caregivers from 1,116 households were elicited risk preferences during August 2021 to May 2022: using one set of incentivized tasks and one practice set
  - 626 individuals from 626 households participated in both tasks: benchmark sample

Elicitation Tasks for Time Preferences: Multiple Price List Method (SET 1)

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Decision	Option A ($M^T_{A,j}$) next month		Option B ($M^T_{B,j}$) in 2 months
1	100	or	105
2	100	or	110
3	100	or	120
4	100	or	130
5	100	or	150
6	100	or	200

All rewards are in Thai Baht (THB).

Elicitation Tasks for Time Preferences: Multiple Price List Method (SET 2)

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Decision	Option A THB today		Option B THB next months
1	100	or	105
2	100	or	110
3	100	or	120
4	100	or	130
5	100	or	150
6	100	or	200

All rewards are in Thai Baht (THB).

Elicitation Tasks for Risk Preferences: Multiple Price List Method

Decision	Prob. of Larger Payoff	Option A		Option B	
	π_j	$M^R_{A,l}$	$M^R_{A,h}$	$M^R_{B,l}$	$M^R_{B,h}$
1	0.1	1,000	1,200	100	2,500
2	0.2	1,000	1,200	100	2,500
3	0.3	1,000	1,200	100	2,500
4	0.4	1,000	1,200	100	2,500
5	0.5	1,000	1,200	100	2,500
6	0.6	1,000	1,200	100	2,500
7	0.7	1,000	1,200	100	2,500
8	0.8	1,000	1,200	100	2,500
9	0.9	1,000	1,200	100	2,500
10	1.0	1,000	1,200	100	2,500

All rewards are in Thai Baht (THB).

Measuring Risk Preference Parameter

- Each i has the following CRRA utility function

$$U_i(c) = \frac{c^{1-\gamma_i} - 1}{1 - \gamma_i} \tag{1}$$

where γ_i is the relative risk aversion coefficient

- We estimated each individual's risk preference parameter, γ_i, using the following indifference condition

$$\begin{aligned}(1-\pi^*)\, U_i\left(c_i + M^R_{A,l}\right) + \pi^*\, U_i\left(c_i + M^R_{A,h}\right) = \\ (1-\pi^*)\, U_i\left(c_i + M^R_{B,l}\right) + \pi^*\, U_i\left(c_i + M^R_{B,h}\right)\end{aligned}$$

where $M^R_{O,l}$ and $M^R_{O,h}$ denote the lower and the higher payoffs from option $O = A, B$, respectively, π^* is the indifference probability at which individual values both options equally, and c_i is weekly per capita consumption for i

Approximating the Indifference Probability

- For example, an individual chose safer option at task $j = 6$ with $\pi_j = 0.6$ and switched to the riskier one at task $j + 1 = 7$ with $\pi_{j+1} = 0.7$: the indifference probability is set to be the midpoint, i.e., $\pi^* = \dfrac{\pi_j + \pi_{j+1}}{2} = 0.65$

Decision	Prob. of Larger Payoff	Option A		Option B	
	π_j	$M^R_{A,l}$	$M^R_{A,h}$	$M^R_{B,l}$	$M^R_{B,h}$
6	0.6	1,000	1,200	100	2,500
7	0.7	1,000	1,200	100	2,500

- We estimated each switching point and then take the average for an individual who switches more than once

Measuring Per Capita (non-durable) Consumption For Each Individual

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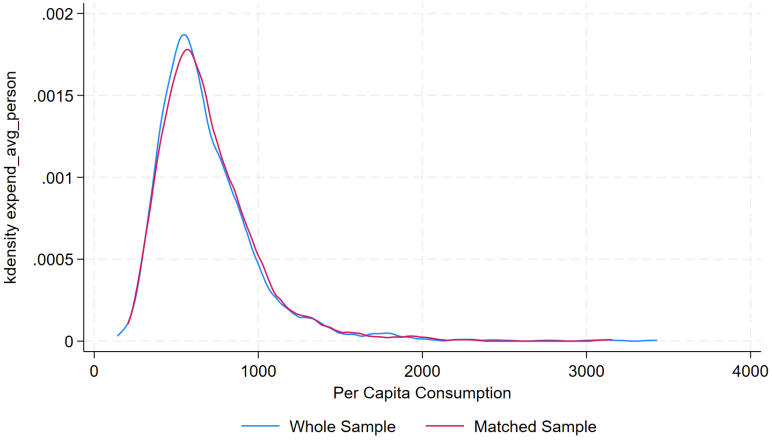
- Taking advantage of the household panel data, we measure each individual's consumption by per capita (weekly) non-durable consumption of his/her household:
  1. foods
  2. utilities
  3. health
  4. recreation
  5. education
  6. apparels
- To reduce measurement errors in consumption, we average the consumption over five years (2017-2021)

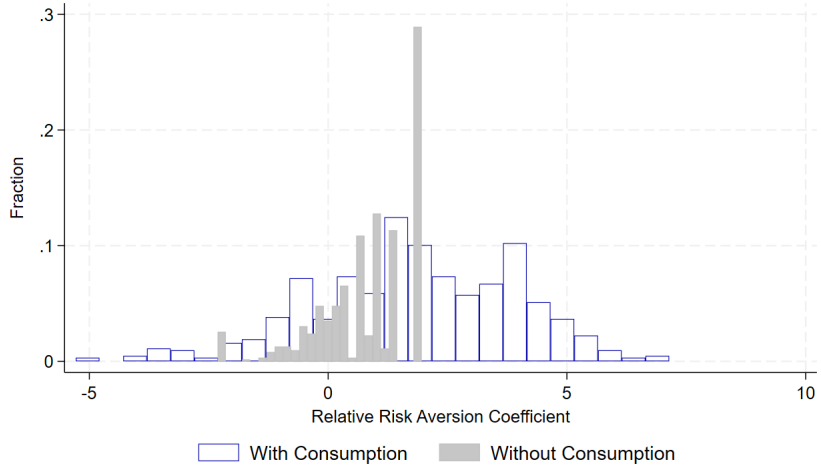
Distribution of Weekly Per Capita (non-durable) Consumption

- Benchmark (Whole) Sample: Mean = 695 (699) THB, SD = 304 (405) THB



Distribution of Risk Preference Parameter

- With (Without) consumption: Mean = 1.81 (0.84), SD = 2.11 (1.01)



- We estimated the discount factor using the following indifference condition.

$$U\left(c_i + M_A^T\right) + \delta_i U(c_i) = U(c_i) + \delta_i U\left(c_i + M_B^{T*}\right), \tag{2}$$

where M_B^{T*} is the later rewards, at which the individual values both options equally

- We solved for the individual's discount factor, δ_i, using the following formula.

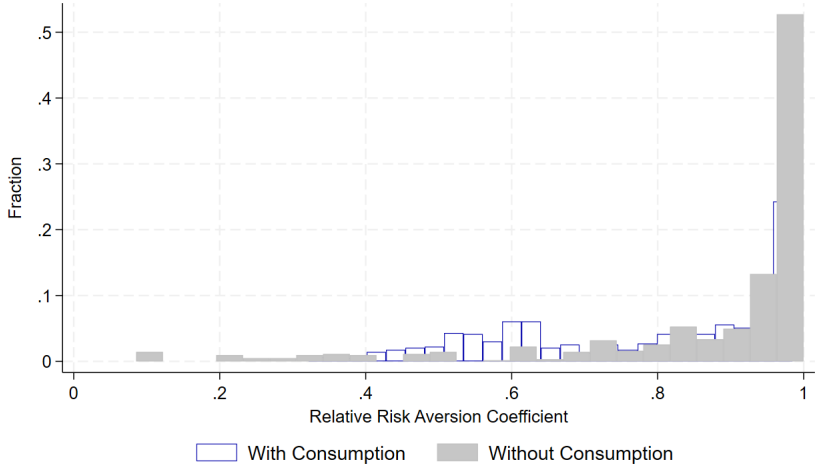
$$\hat{\delta}_i = \frac{U(c_i) + U\left(c_i + M_A^T\right)}{U(c_i) + U\left(c_i + M_B^{T*}\right)}. \tag{3}$$

Approximating the Indifference Later Rewards

- For example, an individual chose earlier option at task $j = 3$ with $M^T_{B,J} = 120$ and switched to the later one at task $j + 1 = 4$ with $M^T_{B,J+1} = 130$: the indifference later reward is set to be the midpoint, i.e., $M^{T*}_B = \dfrac{M^T_{B,J} + M^T_{B,J+1}}{2} = 125$

Decision	Option A ($M^T_{A,j}$) next month		Option B ($M^T_{B,j}$) in 2 months
3	100	or	120
4	100	or	130

- With (Without) consumption: Mean = 0.77 (0.77), SD = 0.19 (0.19)



Benchmark Model with Linear Relationship

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- This paper estimated the following linear model:

$$Y_{i,a} = \beta_{0,a} + \beta_{\gamma,a}\hat{\gamma}_i + \beta_{\delta,a}\hat{\delta}_i + \boldsymbol{\beta}_{X,a}\boldsymbol{X}_{i,a} + \lambda_{t,a} + \varepsilon_{i,a},$$

  where $Y_{i,a}$ is the time or material investment or expectations, $\boldsymbol{X}_{i,a}$ are control variables, and $\lambda_{t,a}$ are the survey-year fixed-effects

- Following Durbin (1954), we corrected for measurement errors of the estimated variables (error-in-variable problem) using IVs (another round of tasks for time and for risk)

Benchmark Results for All Cohorts

- Caregivers perceive parental investment to be a risky activity
- Achieving educational success and pursuing a STEM job are perceived as risky endeavors for their children

	Mat.	Time	Expen.	Tutor	Exp. Ba.	Want Ba.	Non-Gov.	STEM
Panel A: All Cohort								
$\hat{\gamma}$	-0.03**	-0.02	0.00	-0.01**	-0.02**	-0.01	-0.02	-0.02**
	(0.01)	(0.02)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.26	0.05	0.05	0.08	0.15	0.00	0.04	0.05
	(0.25)	(0.24)	(0.17)	(0.06)	(0.12)	(0.11)	(0.15)	(0.12)
N	3379	3500	3987	3413	2370	2370	1849	1849
F	93.96	96.56	98.86	97.64	88.97	88.97	86.04	86.04

Note: Clustered-standard errors at the child level are in parentheses: * p<0.10, ** p<0.05,*** p<0.01.

Results for Early Childhood Sample (4-6 years)

- Caregivers seem to consider parental investment as a risky activity from the early childhood stage onward

	Mat.	Time	Expen.	Tutor	Exp. Ba.	Want Ba.	Non-Gov.	STEM
Panel B: Early Childhood Group (cohort 4 years to 6 years)								
$\hat{\gamma}$	-0.03**	-0.02	0.00	-0.01**	-0.01	0.01	-0.04**	-0.04**
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
$\hat{\delta}$	0.00	0.01	-0.07	-0.04	-0.07	-0.16	0.28	-0.05
	(0.30)	(0.32)	(0.24)	(0.07)	(0.19)	(0.15)	(0.29)	(0.24)
N	1507	1612	1646	1461	807	807	430	430.00
F	86.62	93.70	92.33	81.82	60.53	60.53	36.68	36.68

Note: Clustered-standard errors at the child level are in parentheses: * p<0.10, ** p<0.05,*** p<0.01.

Results for Young Children (7-9 years)

- Caregivers tend to value later investments (during the primary school-aged years) more than earlier ones (during the early childhood stage): contrasting with scientific evidence

	Mat.	Time	Expen.	Tutor	Exp. Ba.	Want Ba.	Non-Gov.	STEM
Panel C: Older Early Childhood Group (cohort 7 years to 9 years)								
$\hat{\gamma}$	-0.01	-0.01	-0.01	-0.01	-0.03***	-0.02	-0.01	-0.02**
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.74**	0.05	0.30	0.23**	0.37**	0.04	0.08	0.12
	(0.37)	(0.31)	(0.19)	(0.11)	(0.16)	(0.14)	(0.19)	(0.14)
N	1277	1316	1363	1368	1102	1102	1047	1047
F	83.26	88.88	88.07	88.94	82.24	82.24	74.98	74.98

Note: Clustered-standard errors at the child level are in parentheses: * p<0.10, ** p<0.05,*** p<0.01.

Conclusion and Discussion

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- Caregivers seem to consider parental investment as a risky activity (e.g., future returns to human capital are uncertain) from the early childhood stage onward
  - providing households with better insurance could potentially increase parental investment as well
  - This result differs from that found by Cuna et al. (2025), who considered nutritional intakes as the investment
- Caregivers tend to value later investments more than earlier ones
  - An information provision intervention aimed at informing caregivers about new scientific evidence regarding the benefits of early investment may be beneficial
- Caregivers perceive achieving educational success and pursuing a STEM career as risky endeavors for their children
  - Providing better insurance to disadvantaged households could potentially increase the likelihood of their children pursuing STEM careers

APPENDIX

Sample Size of RIECE Panel Data (RPD): Each Survey Round (up to 2023)

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Year Survey	No. of Children		No. of HH	
	target	sample	target	sample
2016	N.A.	1,666	N.A.	1,411
2017	1,666	1,506	1,411	1,266
2018	1,666	1,397	1,411	1,182
2019	1,666	1,434	1,411	1,230
2020	1,451	1,395	1,290	1,205
2021	1,448	1,324	1,290	1,155
2022	1,324	1,261	1,155	1,099
2023	1,261	1,227	1,099	1,071

Summary Statistics (Part 1)

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	Main Sample			Whole Sample		
	mean	sd	n	mean	sd	n
Materials investment	-0.07	0.91	3,679	-0.04	0.97	7,136
Time investment	-0.06	0.96	3,808	-0.01	0.99	7,444
Education expenditure	-0.16	0.72	4,323	-0.10	0.92	8,552
Private tutoring	0.08	0.27	3,705	0.09	0.28	7,339
Expecting college or above	0.34	0.47	2,544	0.35	0.48	4,948
Wanting college or above	0.81	0.39	2,544	0.79	0.40	4,948
Wanting non-gov. jobs	0.54	0.50	1,983	0.54	0.50	3,981
Wanting STEM jobs	0.19	0.39	1,983	0.18	0.38	3,981
Risk aversion coeff. $\hat{\gamma}$	1.81	2.11	4,331	1.77	2.03	8,573
Discount factor $\hat{\delta}$	0.77	0.19	4,331	0.77	0.19	6,785
No. of waiting decisions	2.63	2.36	4,331	2.62	2.36	6,785
No. of riskier decisions	3.90	2.35	4,310	3.82	2.30	8,545
Wealth	-0.07	1.09	4,310	-0.05	1.20	8,513

Summary Statistics (Part 2)

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	Main Sample			Whole Sample		
	mean	sd	n	mean	sd	n
Divorce before	0.33	0.47	4,331	0.33	0.47	8,573
Teen mom	0.18	0.39	4,061	0.18	0.39	8,150
Parental absence	0.54	0.50	4,331	0.45	0.50	8,573
Schooling CG	7.06	3.48	4,310	7.22	3.63	8,539
Age of CG	49.94	12.45	4,319	49.29	13.20	8,542
Parent as CG	0.28	0.45	4,331	0.31	0.46	8,573
Female CG	0.93	0.25	4,331	0.92	0.27	8,572
Female	0.49	0.50	4,331	0.49	0.50	8,573
Firstborn notsingle	0.13	0.34	4,331	0.15	0.36	8,573
Notfirstborn notsingle	0.24	0.43	4,331	0.26	0.44	8,573
HH size	4.86	1.62	4,331	5.21	1.77	8,573
No. children	1.63	0.75	4,331	1.74	0.80	8,573
No. siblings	0.37	0.57	4,331	0.41	0.60	8,573
No. chronic diseases	0.28	0.55	4,321	0.30	0.58	8,536

Measuring Parental Time Investment

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- To capture the difference in human capital production functions over the life cycles, we measure parental time investment for each age group using principal component analysis based on the following items
  1. Reading
  2. Storytelling
  3. Drawing and coloring
  4. Role-playing
  5. Writing and counting practices
  6. Homework

  All are as the number of days
- Different age groups may use different sets of items due to the QN structure
- We standardized the material investment index to have a mean of zero and a standard deviation of one

Measuring Parental Material Investment

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- Similarly to time investment, we measure parental material investment for each age group using principal component analysis based on the following items
  1. Number of storybooks
  2. Number of picture books
  3. Number of posters showing alphabets or numbers
  4. Number of books for writing and counting practices
- Different age groups may use different sets of items due to the QN structure
- We standardized the material investment index to have a mean of zero and a standard deviation of one

Education Expenditure and Private Tutoring

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- We measure education expenditure using expenditure for all items used in the material investment measurement and
  1. Transportation expenses
  2. Tuition fees
  3. Tablet purchase costs
  4. Mobile phone purchase costs
  5. Stationery purchase costs
  6. Toys
  7. Extra class fees
  8. Pocket money
- We standardized the material investment index to have a mean of zero and a standard deviation of one
- We also asked caregivers if the child had private tutoring during the previous year: Having Private Tutoring

Education and Occupation Expectations

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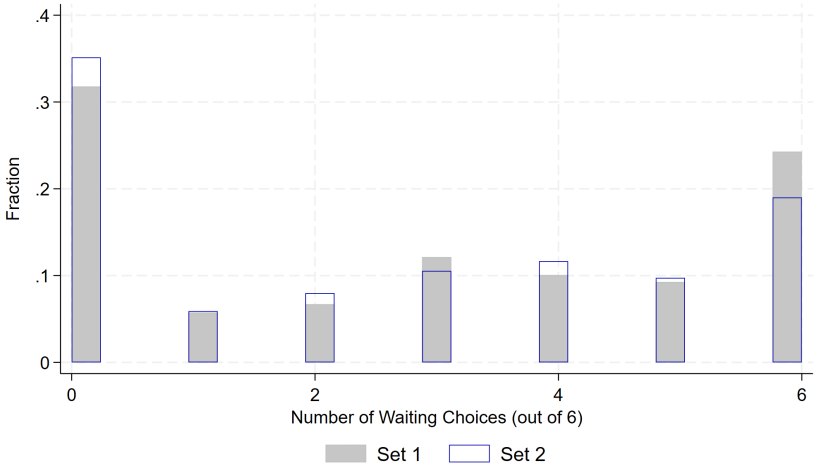
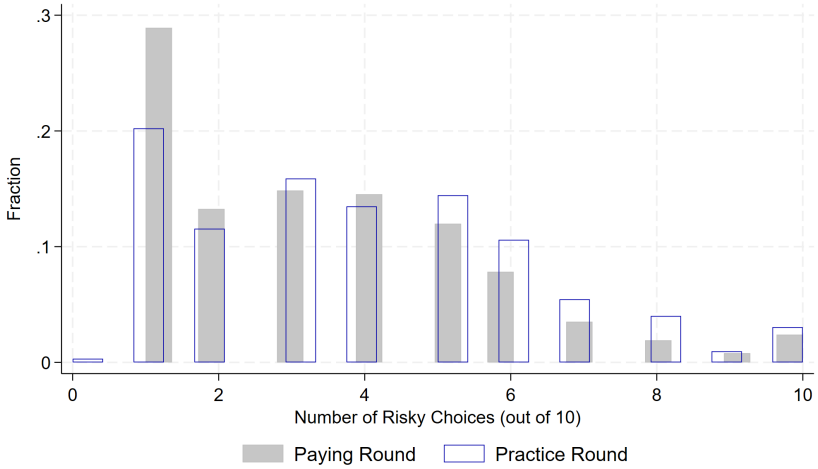
- We measured education expectation using a dummy variable indicating
  1. if caregivers wanted the child to get a college degree
  2. if caregivers expected the child will get a college degree
- We measured occupation expectation using a dummy variable indicating
  1. if caregivers wanted the child to have a non-government job (jobs that are not listed as government jobs, which include teachers, soldiers, policemen, and other civil servants or government employees)
  2. if caregivers wanted the child to have a STEM job (doctors, dentists, nurses, engineers, computer and IT workers, and scientists)

Number of Waiting Choices



Number of Risky Choices



OLS Results for All Cohorts

	Mat.	Time	Expen.	Tutor	Exp. Ba.	Want Ba.	Non-Gov.	STEM
Panel A: All Cohort								
$\hat{\gamma}$	-0.02*	-0.01	0.01	-0.01*	-0.01**	0.00	-0.01*	-0.02***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)
$\hat{\delta}$	0.18	-0.00	0.08	0.00	0.11*	0.05	0.11	0.07
	(0.12)	(0.13)	(0.09)	(0.04)	(0.06)	(0.05)	(0.08)	(0.06)
N	3396	3517	4008	3431	2381	2381	1857	1857

Note: Clustered-standard errors at the child level are in parentheses: * p<0.10, ** p<0.05,*** p<0.01.

OLS Results for Early Childhood Sample (4-6 years)

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	Mat.	Time	Expen.	Tutor	Exp. Ba.	Want Ba.	Non-Gov.	STEM
Panel B: Early Childhood Group (cohort 4 years to 6 years)								
$\hat{\gamma}$	-0.03**	-0.01	0.01	-0.01**	-0.01	0.01	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.17	0.03	0.17	-0.06	0.13	0.05	0.16	0.05
	(0.15)	(0.17)	(0.13)	(0.04)	(0.09)	(0.07)	(0.14)	(0.11)
N	1516	1621	1655	1470	811	811	433.00	433

Note: Clustered-standard errors at the child level are in parentheses: * p<0.10, ** p<0.05,*** p<0.01.

OLS Results for Young Children (7-9 years)

	Mat.	Time	Expen.	Tutor	Exp. Ba.	Want Ba.	Non-Gov.	STEM
Panel C: Older Early Childhood Group (cohort 7 years to 9 years)								
$\hat{\gamma}$	0.00	0.01	-0.00	-0.00	-0.02***	-0.00	-0.02**	-0.02***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$\hat{\delta}$	0.27	-0.10	0.03	0.06	0.14	0.05	0.14	0.12*
	(0.18)	(0.17)	(0.11)	(0.06)	(0.08)	(0.08)	(0.10)	(0.07)
N	1282	1321	1368	1373	1106	1106	1051	1051

Note: Clustered-standard errors at the child level are in parentheses: * p<0.10, ** p<0.05,*** p<0.01.

Parent/caregiver chooses consumption c, leisure ℓ, time investment, I_t, and material investment, I_m, to maximize her/his utility as follows:

$$\max_{c,\ell,I_t,I_m} \frac{c^{1-\gamma}-1}{1-\gamma} + \alpha\frac{\ell^{1-\gamma}-1}{1-\gamma} + \eta\delta S^{ch} \tag{4}$$

subject to

$$c + w\ell + wI_t + I_m \leq wT + b, \tag{5}$$

$$S^{ch} = A\left[\mu I_t^{\frac{\sigma-1}{\sigma}} + (1-\mu)\, I_m^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \tag{6}$$

Analytical Solution to the Model

Optimal choices for consumption, leisure, material investment, and time investment are

$$\ell = \left(\frac{w}{\alpha}\right)^{-\frac{1}{\gamma}} c = \left(\frac{w}{\alpha}\right)^{-\frac{1}{\gamma}} B\delta^{-\frac{1}{\gamma}}, \tag{7}$$

$$I_t = \left(\frac{1-\mu}{\mu} w\right)^{-\sigma} I_m = \left(\frac{1-\mu}{\mu} w\right)^{-\sigma} \left[\frac{wT+b}{1+wD} + GB\delta^{-\frac{1}{\gamma}}\right], \tag{8}$$

where

$$B = \left[\eta A \left(1-\mu\right) \left(\mu D^{\frac{\sigma-1}{\sigma}} + \left(1-\mu\right)\right)^{\frac{1}{1-\sigma}}\right]^{-\frac{1}{\gamma}},$$

$$G = \frac{1 - \left(\frac{w}{\alpha}\right)^{-\frac{1}{\gamma}} w}{1+wD}$$