Intergenerational Transmission of Time Preferences: An Evidence from Rural Thailand

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Rationale

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- Theory: preferences determine economic agent's decisions in an economic model
- Empirical: time preferences affect health behaviors (e.g., Bradford et al., 2017; Chabris et al., 2008; Kirby and Petry, 2004), financial decisions (e.g., Ashraf et al., 2006; Meier and Sprenger, 2010, 2013), and human capital formation (e.g., Cadena and Keys, 2015)
- Question: how are they formed
- Specific Question for this paper: are primary caregiver's time preferences correlated with children's time preferences

- Coller and Williams (1999) designed the multiple price list and implemented it with college students, not taking into account background consumption
- Anderson et al. (2008) elicited both time and risk preferences and estimated a structural model of time and risk parameters, taking into account aggregate background consumption
- Harrison, Lau, and Williams (2002) elicited time preferences of adults in Denmark, using a large incentive (85% of monthly income per capita), and found a nice normal distribution of individual discount factor

- Chowdhury et al. (2022) measured child and parent time preferences in Bangladesh and found that they are correlated
- Falk et al. (2021) found a significant relationship between child and mother time preferences in Germany, using non-incentivized QN for parent
- Brenøe and Epper (2022) also found a significant relationship, using non-incentivized QN for child and parent

- Let $\boldsymbol{c}^1 = \left(c_1^1, \ldots, c_T^1\right)$ and $\boldsymbol{c}^2 = \left(c_1^2, \ldots, c_T^2\right)$ be two consumption streams specifying consumption across time
- An agent i with a period utility function over consumption $V_i(\boldsymbol{c})$ will choose $\boldsymbol{c}^1$ over $\boldsymbol{c}^2$ if and only if

$$V_i\left(\boldsymbol{c}^1\right) \geq V_i\left(\boldsymbol{c}^2\right) \tag{1}$$

- A multiple price list elicitation method (Coller and Williams, 1999) was designed based on this principle with pre-specified pay-off streams (three periods)

Multiple Price List: Set 1
Next Month versus Two Month

Decision	Option A THB next month		Option B THB 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

Note that the last column was not shown to the participants.

Multiple Price List: Set 2
Today versus Next Month

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

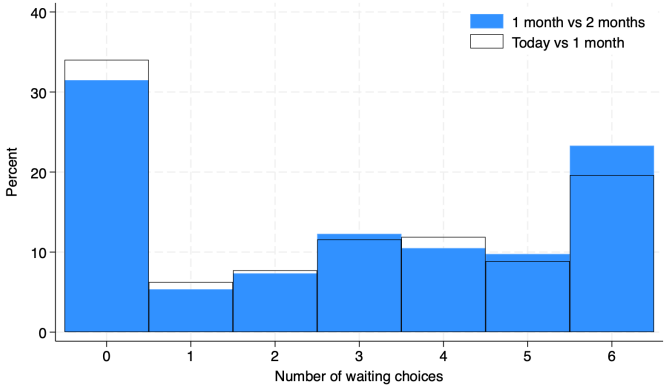
Note that the last column was not shown to the participants.

- Following Laibson (1997), we used a quasi-hyperbolic discounting utility function

$$V_i = u_i(c_{i,1}) + \beta_i \delta_i \left[u_i(c_{i,2}) + \delta_i u_i(c_{i,3}) \right], \tag{2}$$

  where δ_i and β_i are the long-run discount factor and time-consistent parameter of individual i
- An individual will be present-biased (future-biased) if $\beta_i < 1$ ($\beta_i > 1$)

- Most of the participants never changed their choices: either never waited or waited all



- An individual i with utility function U, is indifferent between the sooner reward M_t and the switching later reward M_{t+1} if and only if

$$U(c_i + M_t) + \delta_i U(c_i) = U(c_i) + \delta_i U(c_i + M_{t+1}), \quad (3)$$

  where δ_i is the long-run discount factor, and c_i is monthly consumption per-capita of household i
- We can identify the long-run discount factor δ_i

- We assume that the utility function is in the form of a log utility function:

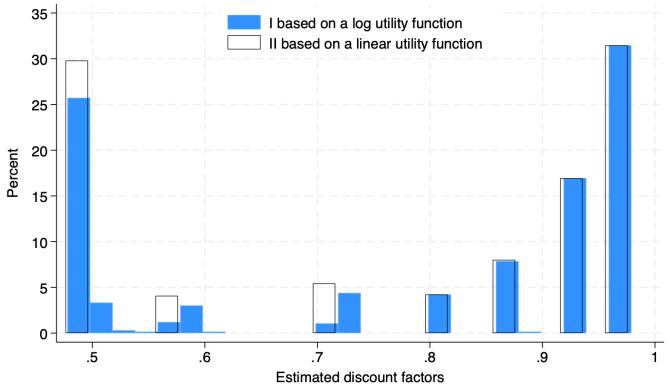
$$U(c_i) = \ln(c_i) \tag{4}$$

- Approximating the switching later reward by the average between the later larger payoff at the switching point, the discount factor is

$$\delta_i = \frac{\ln\left(1 + \frac{100}{c_i}\right)}{\ln\left(1 + \frac{M_{t+1}^{j-1} + M_{t+1}^{j}}{2c_i}\right)} \tag{5}$$

Distribution of Individual Discount Factor

- The average of the long-run monthly discount factor is 0.78 (equivalent to a monthly discount rate of 0.28)



- An individual i with utility function U, is indifferent between the sooner reward M_t and the switching later reward M_{t+1} if and only if

$$U(c_i + M_t) + \beta_i \delta_i U(c_i) = U(c_i) + \beta_i \delta_i U(c_i + M_{t+1}), \quad (6)$$

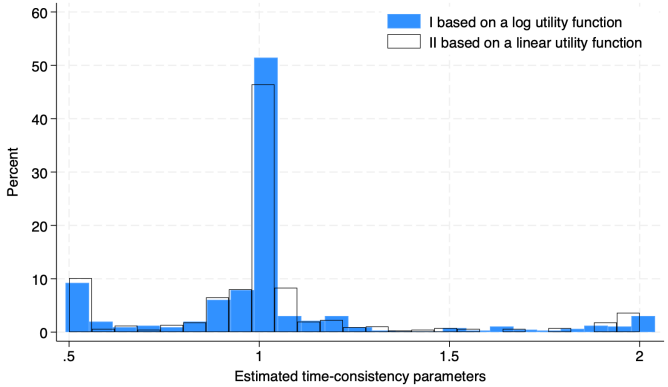
where β_i is the time-consistent parameter

- Using the data from Set 2 and β_i from preceding step, we can identify the present-bias parameter δ_i for the log utility case as follows.

$$\beta_i = \frac{1}{\delta_i} \frac{\ln\left(1 + \frac{100}{c_i}\right)}{\ln\left(1 + \frac{M_{t+1}^{j-1} + M_{t+1}^{j}}{2c_i}\right)} \tag{7}$$

Distribution of Individual Discount Factor

- The average of the present-bias parameter is 1.02: an average sample is time-consistent



Elicitation Task for Young Children

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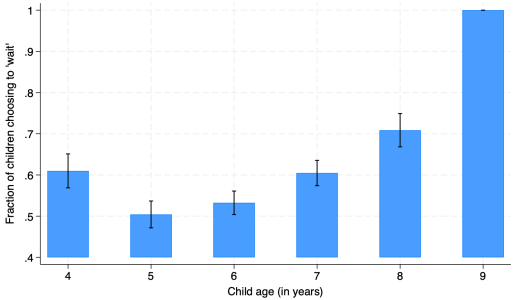
- We adapted the marshmallow test (Mischel et al., 1972)
- Kindergarten children were to choose from the following two options: one chosen item today and two items tomorrow
- Primary children were to choose from three options:
  1. two items today and nothing tomorrow
  2. one item today and two items tomorrow
  3. nothing today and four items tomorrow
- To combine both data, we group the second and third options as the waiting one

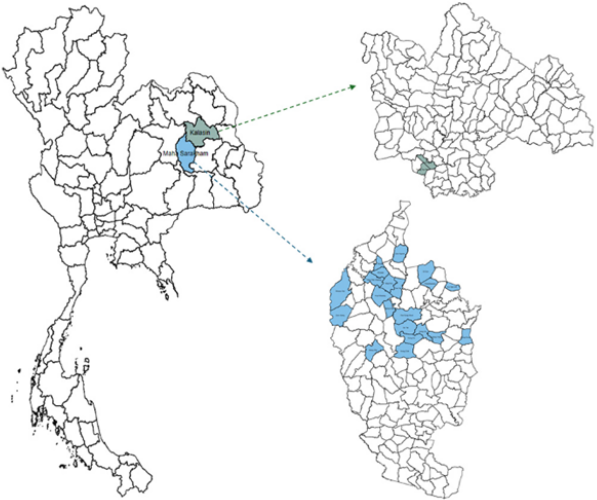
Distribution of Waiting Choices
Young Children

- The fraction of children who waited is U-shaped, with the turning point at five (similar to Andreoni et al. (2019))
- This paper dropped children younger than five



- RIECE Panel Data (RPD) is an annual panel data from a rural area of Thailand
- The survey started in June 2016, targeting children one to four years old in Mahasarakham and Kalasin provinces, where the RIECE Thailand project started. Therefore, we call the data "RIECE Panel Data (RPD)"

Map showing Tambons in the Survey



Sample Size of RPD for Each Survey Year

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Year	Children		Household	
	Baseline	Resurvey	Baseline	Resurvey
2015	1,054	N.A.	1.006	N.A.
2016	1,040	628	886	529
2017	N.A.	1,507	N.A.	1,284
2018	N.A.	1,397	N.A.	1,195
2019	N.A.	1,430	N.A.	1,238
2021	N.A.	1,395	N.A.	1,214
2022	N.A.	1,255	N.A.	1,096

1. Household QN was adapted from the Annual Townsend Thai Data Survey and Thailand Socio-Economic Survey (SES): working time, sleeping time, leisure time, caregivers' risk, time, and social preferences
2. Children information QN: gestation duration, birth weight, activity time, material investment, child health
3. Child development QN: cognitive and non-cognitive skills, risk, time, and social preferences
4. School QN: classroom observation records

Summary Statistics
Children

Variables	Main sample		Whole sample	
	Mean (SD)	N	Mean (SD)	N
	or Proportion	N	or Proportion	N
Decision to wait	0.568	709	0.576	1078
Chose sweet as a reward	0.447	709	0.457	1062
Age (in months)	74.34 (11.63)	709	71.53 (14.51)	1078
Girl	47.2%	709	49.1%	1078
Math ability	0.02 (1.00)	709	0.03 (1.00)	1077
Literacy ability	0.01 (1.00)	709	0.03 (0.98)	1069
Only child	45.1%	709	43.4%	1078
First-born child	18.3%	709	18.1%	1078
Number of siblings	0.53 (0.62)	709	0.54 (0.62)	1078

Summary Statistics
Children (Con't)

Variables	Main sample		Whole sample	
	Mean (SD)	N	Mean (SD)	N
	or Proportion	N	or Proportion	N
Wealth (via factor analysis)	-0.03 (0.65)	709	-0.01 (0.66)	1078
Parent as caregiver	28.6%	709	27.1%	1006
One parent	18.8%	709	18.0%	1078
Both parents	34.8%	709	37.3%	1078
Parents are divorced	19.2%	697	17.6%	1054
Screen time	0.03 (1.02)	709	-0.004 (0.99)	1075
Sleep time	-0.03 (1.00)	709	-0.003 (1.00)	1075
Activity time	-0.03 (1.01)	709	0.001 (1.01)	1076

Summary Statistics
Caregivers

Variables	Main sample		Whole sample	
	Mean (SD)	N	Mean (SD)	N
	or Proportion	N	or Proportion	N
Number of waiting choices in set 1	2.97 (2.40)	659	2.87 (2.39)	953
Estimated discount factor I	0.78 (0.21)	659	0.77 (0.21)	952
Estimated discount factor II	0.80 (0.21)	659	0.79 (0.21)	953
Estimated time-consistency parameter I	1.02 (0.31)	659	1.02 (0.31)	950
Estimated time-consistency parameter II	1.02 (0.31)	659	1.02 (0.31)	951

Summary Statistics
Caregivers (Con't)

Variables	Main sample		Whole sample	
	Mean (SD)	N	Mean (SD)	N
	or Proportion	N	or Proportion	N
Age (years)	50.91 (12.70)	658	50.68 (13.16)	963
Female	0.9	659	0.908	966
Education (years in school)	7.14 (3.69)	656	7.04 (3.58)	961
Elicitation-task-related				
Task payoff wanted	0.923	659	0.916	961
Caregiver played set 1 first	0.423	659	0.433	966
Caregiver's choice consistent	0.748	659	0.733	959

Empirical Results

- The main analysis estimates the following linear specification:

$$TP_i^c = \alpha_0 + \alpha_1 \delta_i^p + \alpha_2 \beta_i^p + \boldsymbol{\alpha}_3 \boldsymbol{X}_i + \varepsilon_i, \tag{8}$$

- Key Parameter α_1 captures the association between the time preferences of the caregiver and the child (intergenerational transmission)

Main Results with the Log Utility

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Outcome:	(I)	(II)	(III)	(IV)
Child's choice to wait	OLS	OLS	Probit	Probit
CG discount factor I	0.274***	0.229**	0.273***	0.228**
	(0.092)	(0.100)	(0.088)	(0.095)
CG time-consistent	0.025	-0.003	0.024	-0.004
	(0.069)	(0.072)	(0.066)	(0.068)
Household wealth	-0.036	-0.031	-0.035	-0.030
	(0.026)	(0.036)	(0.026)	(0.035)
math ability	0.020	0.020	0.021	0.020
	(0.017)	(0.018)	(0.017)	(0.018)
literacy ability	0.044**	0.047**	0.044**	0.047**
	(0.020)	(0.019)	(0.019)	(0.019)
Observations	709	693	709	693

Main Results
with the Linear Utility

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Outcome:	(I)	(II)	(III)	(IV)
Child's choice to wait	OLS	OLS	Probit	Probit
CG discount factor	0.250***	0.203*	0.249***	0.202**
	(0.091)	(0.099)	(0.087)	(0.094)
CG time-consistent	0.027	-0.001	0.025	-0.002
	(0.069)	(0.072)	(0.066)	(0.068)
Household wealth	-0.036	-0.032	-0.036	-0.030
	(0.026)	(0.036)	(0.026)	(0.035)
math ability	0.020	0.020	0.021	0.020
	(0.017)	(0.018)	(0.017)	(0.018)
literacy ability	0.044**	0.047**	0.044**	0.047**
	(0.020)	(0.019)	(0.019)	(0.018)
Observations	709	693	709	693

Main Results
with Number of Waiting Choices

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Outcome:	(I)	(II)	(III)	(IV)
Child's choice to wait	OLS	OLS	Probit	Probit
CG number of waiting	0.016**	0.017*	0.016**	0.017*
	(0.007)	(0.008)	(0.007)	(0.007)
CG Present-biased	0.063	0.037	0.063	0.037
	(0.044)	(0.045)	(0.043)	(0.044)
CG Future-biased	0.029	-0.004	0.028	-0.007
	(0.046)	(0.046)	(0.045)	(0.044)
math ability	0.022	0.021	0.022	0.022
	(0.017)	(0.018)	(0.017)	(0.018)
literacy ability	0.045**	0.048**	0.045**	0.047***
Observations	709	693	709	693

- The heterogeneous effects are estimated using the following specification:

$$TP_i^c = \gamma_0 + \gamma_1 \beta_i^p + \gamma_2 \delta_i^p + \gamma_3 \beta_i^p \times H_i + \gamma_4 H_i + \boldsymbol{\gamma}_5 \boldsymbol{X}_i + \varepsilon_i \quad (9)$$

  where H_i is a subgroup characteristic of interest capturing the heterogeneity
- Key Parameter γ_3 captures the heterogeneous effect with respect to H_i
- Overall, the relationship is homogeneous

Heterogeneous Effects

	Discount factor I		Discount factor II		No. of waiting choices	
	(I) OLS	(II) Probit	(III) OLS	(IV) Probit	(V) OLS	(VI) Probit
One parent	-0.054	-0.051	-0.067	-0.065	-0.001	-0.001
	(0.249)	(0.239)	(0.247)	(0.237)	(0.021)	(0.020)
Both parents	0.305	0.308	0.274	0.277	0.034*	0.035**
	(0.205)	(0.198)	(0.203)	(0.195)	(0.017)	(0.017)
Parent as CG	-0.075	-0.079	-0.081	-0.085	-0.003	-0.003
	(0.182)	(0.177)	(0.183)	(0.178)	(0.016)	(0.015)
Divorced	-0.113	-0.117	-0.106	-0.109	-0.007	-0.007
	(0.185)	(0.175)	(0.182)	(0.172)	(0.018)	(0.017)
CG Age (years)	0.017***	0.017***	0.017***	0.017***	0.001**	0.001***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.001)	(0.001)
CG Years of edu	-0.017	-0.018	-0.016	-0.017	-0.001	-0.001
	(0.021)	(0.021)	(0.022)	(0.021)	(0.002)	(0.002)

Heterogeneous Effects (Con't)

	Discount factor I		Discount factor II		No. of waiting choices	
	(I) OLS	(II) Probit	(III) OLS	(IV) Probit	(V) OLS	(VI) Probit
Same gender	-0.191	-0.184	-0.216	-0.209	-0.011	-0.011
	(0.185)	(0.177)	(0.183)	(0.176)	(0.016)	(0.016)
Parenting style	0.038	0.048	0.025	0.035	0.006	0.007
	(0.117)	(0.113)	(0.114)	(0.110)	(0.010)	(0.010)
Age (months)	-0.001	<-0.001	<-0.001	<0.001	<0.001	<0.001
	(0.008)	(0.008)	(0.008)	(0.008)	(<0.001)	(<0.001)
Female (d)	-0.125	-0.116	-0.152	-0.144	-0.006	-0.006
	(0.190)	(0.183)	(0.189)	(0.182)	(0.017)	(0.016)
Math	-0.037	-0.034	-0.046	-0.043	<0.001	<0.001
	(0.090)	(0.088)	(0.089)	(0.087)	(0.008)	(0.008)
Literacy	0.052	0.056	0.050	0.054	0.005	0.005
	(0.094)	(0.090)	(0.093)	(0.089)	(0.008)	(0.008)

Heterogeneous Effects (Con't)

	Discount factor I		Discount factor II		No. of waiting choices	
	(I) OLS	(II) Probit	(III) OLS	(IV) Probit	(V) OLS	(VI) Probit
Only child (d)	-0.183	-0.183	-0.198	-0.197	-0.021	-0.021
	(0.148)	(0.141)	(0.146)	(0.139)	(0.014)	(0.013)
First-born (d)	0.045	0.040	0.053	0.047	0.002	0.001
	(0.247)	(0.240)	(0.248)	(0.241)	(0.021)	(0.021)
No. of siblings	-0.032	-0.029	-0.033	-0.030	0.003	0.004
	(0.137)	(0.133)	(0.134)	(0.129)	(0.012)	(0.012)
Screen time (d)	-0.059	-0.058	-0.043	-0.041	-0.012	-0.012
	(0.166)	(0.161)	(0.160)	(0.155)	(0.014)	(0.014)
Sleep time (d)	-0.214	-0.208	-0.210	-0.204	-0.014	-0.014
	(0.180)	(0.174)	(0.176)	(0.170)	(0.016)	(0.015)
Activity time (d)	0.092	0.080	0.084	0.073	0.016	0.015
	(0.193)	(0.186)	(0.189)	(0.181)	(0.016)	(0.015)
Wealth	-0.101	-0.104	-0.116	-0.118	-0.001	-0.001
	(0.122)	(0.115)	(0.120)	(0.113)	(0.011)	(0.011)

- This study investigated the intergenerational relationship between a child's and caregiver's time preferences with non-parent caregivers
- We estimated the caregiver's discount factor and time-consistent parameter based on the multiple price list method with household consumption (different from Anderson et al. (2008), who used aggregate per capita consumption)
- We also controlled for a comprehensive set of potential factors associated with a child's ability to delay gratification

- Child's ability to wait and the caregiver's long-run discount factor are significantly positively correlated, consistent with Chowdhury et al. (2022), Falk et al. (2021), and Brenøe and Epper (2022)
- Our study separately investigates math and literacy ability and finds that only literacy ability significantly correlates to a child's ability to wait
- No significant correlation between screen time (for television and the internet) and a child's ability to wait

Limitations

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- This study's elicitation task for child time preference is a one-binary decision task: implausible to measure the discount factor and time-consistency parameter for the child
- Our paper has to assume a specific form for the utility function (log and linear utility functions) to estimate individual discount factors
- There might be measurement errors due to household consumption and other possible biases in the estimates due to omitted variables