Altruistic or Exchange Motive? Evidence on the Effect of Children's Health Shocks on Intra-household Resource Allocation

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Dec 2025

Introduction

- Most family decision models assume that parents provide resources to children because
  - ▶ Altruistic motive: parents care about their children's consumption and welfare (Becker, 1976, Becker and Tomes, 1976, and Bernheim and Severinov, 2003)
  - ▶ Exchange motive: parents want services or transfers in return from their children (Becker, 1981, Jensen, 1990, Ehrlich and Lui, 1991, and Becker et al., 2016)
- These motives imply different outcomes for public policies that redistribute income
  - ▶ Altruistic motive: government transfer could be neutralized by adjusting private intergenerational transfer within the family (Barro, 1974, Bernheim et al., 1986, Bernheim and Bagwell, 1988)
  - ▶ Exchange motive: the neutrality results will not hold

Introduction

- Previous studies analyze how parents respond to children's endowments and find mixed results
  - ▶ Reinforcing strategy by investing more in advantaged children (Aizer and Cunha, 2010, Ashenfelter and Rouse, 1998, Datar et al., 2010, Rosales-Rueda, 2014, Rosenzweig and Wolpin, 1988, Rosenzweig and Zhang, 2009, Yi et al., 2015)
  - ▶ Compensating strategy by investing more in less advantaged children (Del Bono et al., 2012, Yi et al., 2015)
- Parental responses differ by socio-economic status (SES)
  - ▶ Hsin (2012) and Restrepo (2016) find highly educated parents compensate, while less educated parents reinforce
  - ▶ Gratz and Torche (2016) show high-SES parents reinforce, whereas low-SES parents do not respond to differences in ability

Introduction

- How do parental investments and transfers respond to children's health shocks? Any difference by parental education?
- What are the underlying motives that drive parental behaviors? Altruistic or exchange motive?

This Paper

- Document the compensating/reinforcing behavior using twins data
  - Analyze how children's health shocks affect parents' decisions about educational investment and monetary transfer
  - How parental decisions vary depending on the parental education
- Develop and estimate an intra-household resource allocation model with altruistic and exchange motives
  - Show models with single motive cannot fit the data
  - Conduct simulations to show the relative importance of each motive among low- and high-educated parents
  - Counterfactual analysis on education subsidy

Preview of Results

- Use the Chinese Adult Twins Survey and Chinese Child Twins Survey
  - ▶ High-educated parents: reinforce in investment and compensate in transfer.
  - ▶ Low-educated parents: reinforce in transfer and do not respond in investment
- Develop a model with both motives: allow low- and high-educated parents to differ in their altruistic and exchange motives
- Estimate the model
  - ▶ High-educated parents: altruistic motive
  - ▶ Low-educated parents: altruistic and exchange motives
- Counterfactual analysis
  - ▶ Public education subsidy crowds out private investment and has positive spillovers on the investment in healthy child and transfers to both children
  - ▶ Effects on children's education and welfare are smaller in high-educated families.

Literature

- Parental responses to children's endowments (Ashenfelter and Rouse, 1998, Rosenzweig and Wolpin, 1988, Rosenzweig and Zhang, 2009, Aizer and Cunha, 2010, Datar et al., 2010, Del Bono et al., 2012, Hsin, 2012, Rosales-Rueda, 2014, Yi et al., 2015, Restrepo, 2016, Gratz and Torche, 2016)
  - ▶ Provide a systematic explanation of how parents' incentives affect their responses to their children's health conditions
- Test the altruistic and exchange motives (Cox 1987, Cox and Rank 1992, McGarry and Schoeni 1995, Altonji et al. 1997, Cox et al. 1998)
  - ▶ Quantify the relative importance of the two motives

Data

- Chinese Adult Twins Survey (CATS)
    - 1,506 pairs of adult twins aged 16 to 62 in five Chinese cities in 2002
    - Observe health, wedding gifts, and eldercare
    - Early health shock: whether has the following diseases before age 18: migraine (25%), rash (22%), disability (17%).
- Chinese Child Twins Survey (CCTS)
    - 2,602 pairs of child twins aged 5 to 19 in Kunming China in 2002
    - Observe health and parental investments
    - Early health shock: whether has the following diseases up to the survey: serious diarrhoea (40%), calcium deficiency (28%), asthma (12%).
- China Health and Retirement Longitudinal Study (CHARLS)
    - Pool the 2011, 2013, and 2015 waves to obtain 20,000 pairs of adult children and their parents
    - Observe time and monetary support and wedding gifts

Summary Statistics

Table 1: Summary Statistics by Parental Education

	Low educ	High educ	Difference
A. Chinese Adult Twins Survey			
Whether healthy at the age of 18	0.93	0.94	0.01
	(0.01)	(0.01)	(0.01)
Years of education	9.89	12.52	2.62***
	(0.09)	(0.08)	(0.12)
Wedding gifts from parents	5,149.69	9,623.09	4473.4***
	(424.22)	(542.76)	(680.23)
Co-residence with parents	0.24	0.20	-0.04**
	(0.01)	(0.02)	(-0.02)
Taking care of parents	0.38	0.21	-0.18***
	(0.01)	(0.01)	(0.02)
B. Chinese Child Twins Survey			
Whether healthy at the time of the survey	0.89	0.88	-0.01
	(0.01)	(0.01)	(0.01)
Education expenditure	692.86	1,339.19	646.33***
	(20.10)	(32.78)	(23.87)
C. China Health and Retirement Longitudinal Study			
Whether parents need help	0.27	0.10	-0.17***
	(0.0014)	(0.0015)	(0.0024)

Notes: Families are classified as high-educated if the parents have a junior high school degree or above.
Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Empirical Specification: Twin FE

The family decision $y_{i\tau}$ (education investment, wedding gifts, and eldercare) for twin i in family τ is

$$y_{i\tau} = \beta_1 h_{i\tau} + \beta_2 h_{j\tau} + \mu_\tau + \epsilon_{i\tau}$$

where $h_{i\tau}$ in an indicator of whether the twin is healthy. β_1 captures the own effect and β_2 captures the cross effect. μ_τ captures factors that are common among the pair of twins.

If the cross-sibling effects are symmetric and equal, we can use the within-twin fixed-effects estimator

$$\Delta y_\tau = (\beta_1 - \beta_2)\Delta h_\tau + \Delta \epsilon_\tau$$

Run the analysis separately for low- and high-educated parents: High-educated parents are those with junior high school degree.

Main Results

Table 2: Effects of children's health shocks on parental investment and transfer decisions (using CATS and CCTS)

	(1) All	(2) Low educ	(3) High educ
A. Log wedding gifts (CATS)			
Good health	0.0520	0.3136**	-0.3194**
	(0.1058)	(0.1351)	(0.1590)
Twin FE	Yes	Yes	Yes
Observations	1,182	692	490
B. Log educational investment (CCTS)			
Good health	0.0650***	-0.0134	0.1104***
	(0.0216)	(0.0321)	(0.0290)
Twin FE	Yes	Yes	Yes
Observations	4,980	2,158	2,822

Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Main Results

Table 3: Effects of children's health shocks on eldercare arrangements (using CATS)

	(1)	(2)	(3)
	All	Low educ	High educ
A. Taking care of parents			
Good health	0.0862**	0.1228**	0.0508
	(0.0421)	(0.0602)	(0.0538)
Twin FE	Yes	Yes	Yes
Observations	2,532	1,232	1300
B. Co-residence with parents			
Good health	0.0808*	0.0923*	0.0588
	(0.0452)	(0.0504)	(0.0899)
Twin FE	Yes	Yes	Yes
Observations	2,020	1,328	692

Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
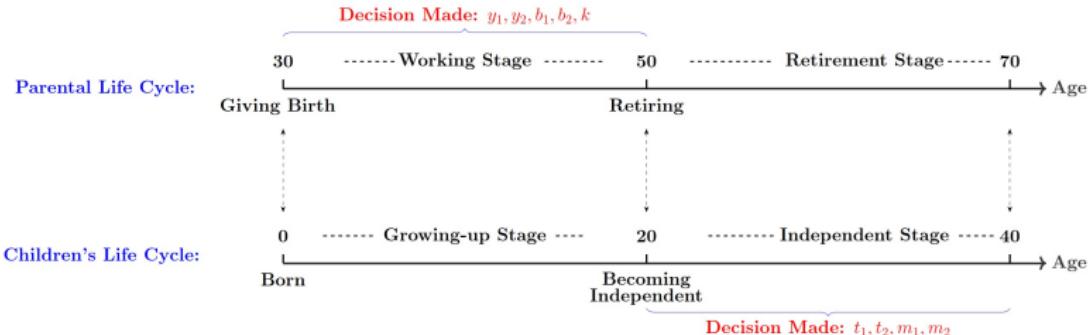
Summary of Reduced-form Findings

	High-educ parents	Low-educ parents
Educational investment	Reinforce	No response
Monetary transfer	Compensate	Reinforce
Co-residence and physical help	No response	Reinforce

Robustness Checks

- Health shocks are random `Results`
- Include birth weight `Results`
- Do health shocks affect marriage? `Results`
- Do wedding gifts affect marriage sorting or bargaining power? `Results`
- Alternative definitions of SES: income `Results`

A Model with Both Motives

- Each family has two children, and Child 1 is healthier than Child 2. Parents differ in their education $j \in \{L, H\}$.

- Parents choose: educational investment y_i, monetary transfer b_i, and savings k

- Children choose: time support t_i and monetary support m_i.

A Model with Both Motives

$$\max_{c_m, c_{o,u}, c_{o,h}, y_1, y_2, b_1, b_2, k} u(c_m) + \beta[(1-p_j)u(c_{o,h}) + \underbrace{(1-p_j)\delta_j(u(c_{1,h})^\rho + u(c_{2,h})^\rho)^{1/\rho}}_{\text{Altruistic motive}}$$

$$+ \underbrace{p_j(u(c_{o,u}) + (q_1 t_1 + q_2 t_2))}_{\text{Exchange motive}} + \underbrace{p_j \delta_j(u(c_{1,u})^\rho + u(c_{2,u})^\rho)^{1/\rho}}_{\text{Interaction of two motives}}]$$

$$s.t. \quad c_m + y_1 + y_2 + b_1 + b_2 + k = I_j$$
$$c_{o,u} = Rk + m_1 + m_2 - x$$
$$c_{o,h} = Rk$$
$$c_{i,u} = w_i + Rb_i - t_i w_i - m_i$$
$$c_{i,h} = w_i + Rb_i$$
$$k \geq 0 \text{ and } y_i \geq 0, b_i \geq 0 \quad \text{for } i \in \{1, 2\},$$

- Altruistic motive δ_j, exchange motive p_j
- Parents receive utility from the quality q_i and quantity t_i of time support

A Model with Both Motives

- Children's education production function

$$e_i = A_j y_i^{\gamma_y} h_i^{\gamma_h}$$

  - Production technology A_j.

- Two types of old-age support: time support and monetary support

$$t_i = t(b_i, e_i)$$
$$m_i = m(b_i, e_i)$$

  - Children's education e_i reduces time support t_i and increases monetary support m_i
  - Parental transfer b_i increases time and monetary supports

- Earnings are a function of education

$$I = g(j, \epsilon_p)$$
$$w_i = g(e_i)$$

Altruistic Motive Model

- $p_j = 0 \Rightarrow$ degenerate to an altruistic motive model
- The ratio of optimal educational investments:

$$\frac{y_1^*}{y_2^*} = \left(\frac{h_1}{h_2}\right)^{\frac{\gamma_h}{1-\gamma_y}}$$

  Parents invest more in Child 1 to achieve efficiency.

- The ratio of optimal consumption:

$$\frac{c_1^*}{c_2^*} = 1$$

  Parents provide more transfer to Child 2 to achieve equality.

- Consistent with high-educated parents' behaviors

Exchange Motive Model

- $\delta_j = 0 \Rightarrow$ degenerate to an exchange motive model
- Healthy children provide higher quality time support and more monetary support $\Rightarrow$ parents provide more transfer to the healthy child.
- Education investment is more efficient for the healthy child, but more education could lead to
  - ▶ Less time support
  - ▶ More monetary support

  $\Rightarrow$ ambiguous prediction on investment.
- Consistent with low-educated parents' behaviors

Estimation

Allow high- and low-educated parents to differ in four aspects

- Altruism motive parameter
- Exchange motive parameter (Likelihood to need help)
- Income
- Technology of the education production function

The estimation consists of two parts

- Estimate the eldercare production function and wage process outside the model.
- Estimate the rest of parameters using SMM.

Estimate the Eldercare Production Function

Table 4: Eldercare production functions (using CHARLS)

	(1) Whether provide time support	(2) Whether live with parents	(3) Whether provide transfer	(4) Log transfer
Log wedding gift	0.0151**	0.0148***	0.0069***	0.0508***
	(0.0059)	(0.0026)	(0.0026)	(0.0081)
Child's education	-0.0054***	-0.0080***	0.0068***	0.0287***
	(0.0018)	(0.0009)	(0.0009)	(0.0026)
Family FE	Yes	Yes	Yes	Yes
Observations	6741	30038	27787	20490

- Time support: $t_i = 0.248 + 0.0151(\log(b_i) - \overline{\log(b_i)}) - 0.0054(e_i - \bar{e}_i)$.

- Monetary support:
  $m_i = 20 * \exp(6.959 + 0.0508(\log(b_i) - \overline{\log(b_i)}) + 0.0287(e_i - \bar{e}_i))$.

Estimate the Wage Process

Table 5: Earning Regressions (using Census 2005)

	(1)	(2)
	$\ln(w_{month}+1)$	$\ln(w_{month}+1)$
Junior high school degree	0.7248***	
	(0.0018)	
Years of education		0.1377***
		(0.0002)
Age	0.0388***	0.0287***
	(0.0008)	(0.0008)
Age square	-0.0005***	-0.0004***
	(0.0000)	(0.0000)
Constant	4.9300***	4.3689***
	(0.0143)	(0.0133)
Observations	1053628	1053628
R-squared	0.137	0.266
RMSE	0.825	0.761

- The average 20-year income of low-educated parents is \$81,123, and \$162,136 for high-educated parents.
- The expected 20-year earnings for children are: $w_i = exp(10.34 + 0.1377e_i)$.

Estimate the Rest of the Parameters

Parameters

- Altruistic and exchange motives for low- and high-educated parents
- Parents' inequality aversion
- Quality of time support from healthy and unhealthy children
- Education production function

Moments

- Levels of and Differences in
  - Education investment
  - Monetary transfer
  - Time support

  between healthy and unhealthy children, for low- and high-educated parents
- Children's education by parents' education

Estimation Results

Table 6: Estimation Results

Parameter	Meaning	Coef	S.E.
δ_L	altruism parameter for low-educ parents	5.280	0.015
δ_H	altruism parameter for high-educ parents	7.159	0.851
p_L	probability of needing help for low-educ parents	0.950	0.007
p_H	probability of needing help for high-educ parents	0.210	0.000
ρ	elasticity of substitution	0.513	0.025
q_1	quality of time support from the healthy child	29.998	1.286
q_2	quality of time support from the unhealthy child	5.000	0.241
γ_y	effect of education investment on education	1.650	0.097
γ_h	effect of health on education	1.908	0.032
A_L	education production technology for low-educ parents	-0.636	0.006
A_H	education production technology for high-educ parents	0.611	0.031

Model Fit

Table 7: Model Fit

	Avg educ inv	Diff educ inv	Avg transfer	Diff transfer	Avg time supp	Diff time supp	Avg education
Data							
Low educ parent	0.194	-0.013	0.225	0.314	0.191	0.123	10.556
High educ parent	0.185	0.110	0.182	-0.319	0.162	0.051	13.034
Model							
Low educ parent	0.179	-0.026	0.217	0.308	0.201	0.109	10.607
High educ parent	0.189	0.085	0.206	-0.294	0.206	0.028	13.146

Simulation

- Simulate parents' behaviors assuming that they only have the altruistic motive by setting $p_j = 0$

- Simulate parents' behaviors assuming that they only have the exchange motive by setting $\delta_j = 0$.

Simulation

Table 8: Simulation: Effects of altruistic and exchange motives

	Educational investment		Monetary transfer	
	Child 1	Child 2	Child 1	Child 2
Low-educated parents				
Baseline	100.00	100.00	100.00	100.00
Altruistic motive only	123.05	112.54	44.76	91.92
Exchange motive only	0.11	21.78	65.64	37.83
High-educated parents				
Baseline	100.00	100.00	100.00	100.00
Altruistic motive only	105.18	103.36	88.23	97.73
Exchange motive only	0.05	5.24	17.66	6.07

- The behaviors of low-educated parents are driven by both motives, while those of high-educated parents are mostly driven by the altruistic motive.

Counterfactual

- Provide education subsidies to the unhealthy child for low- and high-educated families
- Examine the effects on parental educational investment and monetary transfer, as well as children's education and their time support to parents

Table 9: Counterfactual: The Impact of Education Subsidy (% change)

	Educational investment		Monetary transfer		Education		Utility	
	Child1	Child2	Child1	Child2	Child1	Child2	Child1	Child2
Low-educated families								
25%	1.3	-19.0	5.1	3.5	1.2	3.6	2.3	2.6
50%	1.6	-41.9	7.2	4.0	1.4	6.2	3.9	4.3
75%	2.0	-64.4	8.1	4.6	1.7	9.0	5.0	5.8
100%	2.3	-85.6	9.2	5.3	2.0	10.3	6.4	7.1
High-educated families								
25%	0.2	-24.4	3.5	3.9	0.1	0.2	1.3	1.5
50%	0.3	-47.7	4.3	4.7	0.1	0.3	1.6	1.9
75%	0.4	-73.6	6.2	6.7	0.2	0.4	1.9	2.4
100%	0.4	-95.3	8.0	8.3	0.2	0.4	2.2	3.0

- Public subsidy crowds out the private investment in unhealthy children.

- Positive spillovers on the investment in healthy children and transfers to both children.

- Public subsidy has a much larger effect on children's education and welfare for low-educated families.

Conclusion

- Use two surveys of Chinese twins (CATS and CCTS) to document that parents with different education respond differently to their children's health shocks.
- Develop and estimate an intra-household resource allocation model with altruistic and exchange motives.
- The behaviors of high-educated parents are mostly explained by the altruistic motive, and those of low-educated parents are jointly explained by the both motives.
  - ▶ Low-educated parents are more likely to be unhealthy, poor, and uninsured.
  - ▶ More rooms to improve the welfare of low-educated families.

Are Health Shocks Random?

- Examine whether health shocks are random following Yi et al (2015).
- Under the null hypothesis that within-twin variation in early health shocks is exogenous, such that $h_{i\tau}$ and $\epsilon_{i\tau}$ are uncorrelated after controlling for the unobservable μ_τ, we have:

$$plim(\hat{\beta}_1 - \hat{\beta}_2) = plim(\widehat{\beta_1 - \beta_2})$$

where $\hat{\beta}_1$ and $\hat{\beta}_2$ are obtained in the OLS estimation and $\widehat{\beta_1 - \beta_2}$ in the fixed-effect estimation.

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Are Health Shocks Random?

Table 10: Twin FE and OLS regressions on wedding gifts (using CATS)

	Low educ		High educ	
	Twin FE	OLS	Twin FE	OLS
	(1)	(2)	(3)	(4)
Own health	0.3136**	0.1886	-0.3144*	0.4123
	(0.1351)	(0.2335)	(0.1669)	(0.2830)
Sibling's health		-0.1251		0.7267**
		(0.2335)		(0.2830)
Twin FE	Yes	No	Yes	No
Observations	692	692	490	490

Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Are Health Shocks Random?

Table 11: Twin FE and OLS regressions on educational investment (using CCTS)

	Low educ		High educ	
	Twin FE	OLS	Twin FE	OLS
	(1)	(2)	(3)	(4)
Own health	-0.0134	-0.0841	0.1104***	-0.0765
	(0.0321)	(0.0890)	(0.0290)	(0.0686)
Sibling's health		-0.0707		-0.1915***
		(0.0890)		(0.0684)
Twin FE	Yes	No	Yes	No
Observations	2,158	2,158	2,822	2,822

Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Are Health Shocks Random?

- CATS: drop heart diseases, hypertension, neurasthenia, and alcoholism. Keep migraine, rash, disability, serious hearing difficulties, allergic to pollen.
- CCTS: drop calcium deficiency and attention deficit disorder. Keep diarrhoea, asthma, fracture, heart disease, serious hearing difficulties, whopping cough, stammer, and serious eyesight problems.

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Are Health Shocks Random?

Table 12: Effects of children's exogenous health shocks on parental investment and transfer decisions (using CATS and CCTS)

	(1) All	(2) Low educ	(3) High educ
A. Log wedding gifts (CATS)			
Good health	0.0916	0.3774***	-0.2893*
	(0.1095)	(0.1411)	(0.1705)
Twin FE	Yes	Yes	Yes
Observations	1,174	686	488
B. Log educational investment (CCTS)			
Good health	0.0336	-0.0066	0.0634**
	(0.0227)	(0.0336)	(0.0307)
Twin FE	Yes	Yes	Yes
Observations	4,732	2,082	2,650

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Inclusion of Birth Weight

Table 13: Effects of children's health shocks on parental investment and transfer decisions (using CATS and CCTS)

	(1)	(2)	(3)
	All	Low educ	High educ
A. Log wedding gifts			
Good health	0.0421	0.3144**	-0.3384**
	(0.1062)	(0.1359)	(0.1669)
Log birth weight	0.1822	-0.0126	0.5233
	(0.1846)	(0.2240)	(0.3360)
Twin FE	Yes	Yes	Yes
Observations	1,182	692	490
B. Log educational investment			
Good health	0.0663***	-0.0121	0.1108***
	(0.0216)	(0.0320)	(0.0291)
Log birth weight	-0.0417	-0.1037	-0.0093
	(0.0383)	(0.0576)	(0.0517)
Twin FE	Yes	Yes	Yes
Observations	4,980	2,158	2,822

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Do Health Shocks Affect Marriage Probability?

Table 14: Effect of health shocks on marital status

	(1)	(2)	(3)
	All	Low educ	High educ
Good health	-0.0267	-0.0528	0.0317
	(0.0371)	(0.0507)	(0.0541)
Twin FE	Yes	Yes	Yes
Observations	2960	1562	1398

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Does Marriage Sorting Affect Wedding Gifts?

Table 15: Relationship between wedding gifts and marital sorting

	(1) All	(2) Low educ	(3) High educ
Good health	0.0354	0.2981**	-0.3530**
	(0.1100)	(0.1397)	(0.1764)
Spouse' age at marriage	0.0232*	0.0182	0.0298
	(0.0124)	(0.0165)	(0.0186)
Spouse' years of education at marriage	0.0153	0.0078	0.0300
	(0.0132)	(0.0169)	(0.0212)
Spouse' log earnings at marriage	0.0348	0.0292	0.0380
	(0.0243)	(0.0303)	(0.0401)
Spouse' parental years of education	0.0093	0.0193	0.0009
	(0.0130)	(0.0190)	(0.0180)
Twin FE	Yes	Yes	Yes
Observations	1146	672	474

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Does Wedding Gifts Affect Bargaining Power?

Table 16: Relationship between wedding gifts and labor market outcomes

	(1) All	(2) Low educ	(3) High educ
A. Bargaining power			
Log wedding gifts	-0.0072	-0.0091	-0.0037
	(0.0099)	(0.0136)	(0.0147)
Good health	0.0053	-0.0015	0.0176
	(0.0257)	(0.0343)	(0.0394)
Twin FE	Yes	Yes	Yes
Observations	1160	680	480
B. Log earnings			
Log wedding gifts	0.0296	0.0297	0.0277
	(0.0395)	(0.0604)	(0.0526)
Good health	0.1921*	0.2147	0.1687
	(0.1160)	(0.1753)	(0.1558)
Twin FE	Yes	Yes	Yes
Observations	658	320	338
C. Employment			
Log wedding gifts	0.0054	0.0373	-0.0257
	(0.0256)	(0.0364)	(0.0352)
Good health	0.0497	-0.0403	0.1519
	(0.0658)	(0.0921)	(0.0925)
Twin FE	Yes	Yes	Yes
Observations	1182	692	490

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Alternative Definition of High- and Low-educated Parents

Table 17: Effects of children's health shocks on parental investment and transfer decisions (using CATS and CCTS)

	(1)	(2)	(3)
	Below junior high shcool	Junior high shcool	High school or above
A. Log wedding gifts			
Good health	0.3136**	-0.1016	-0.5853**
	(0.1351)	(0.2189)	(0.2555)
Twin FE	Yes	Yes	Yes
Observations	692	262	228
B. Log educational investment			
Good health	-0.0134	-0.0010	0.2291***
	(0.0321)	(0.0368)	(0.0465)
Twin FE	Yes	Yes	Yes
Observations	2,158	1,728	1,094

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Alternative Definition of High- and Low-educated Parents

Table 18: Effects of children's health shocks on education investment (using CCTS)

	(1) All	(2) Low income	(3) High income
Good health	0.0427**	-0.0348	0.0950***
	(0.0211)	(0.0332)	(0.0273)
Twin FE	Yes	Yes	Yes
Observations	4,788	2,272	2,516

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Calibration

- A period lasts 20 years and annual interest rate is 3%.
- Medical expenditure when parents are unhealthy is \$108,580.
- Normalize the health of Child 1 to be $h_1 = 2$ and that of Child 2 to be $h_2 = 1$.