

Intergenerational Mobility Pathways: Evidence From a Long Panel from Rural China

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Introduction

- Intergenerational mobility captures an important dimension of equality of opportunity.
- Most estimates of intergenerational mobility are from developed countries and urban areas.
- Channels: literature focuses on the intergenerational transmission through investment in education.
- This paper:
 - **Measures intergenerational mobility in a rural area of China.**
 - **Investigates the transmission channels via cognitive skills, non-cognitive skills and educational attainment.**

Literature Review

- Intergenerational mobility:
 - Theoretical Literature (Becker and Tomes, 1979; Becker and Tomes, 1986; Mulligan 1999; Solon 2004)
 - Measurement of intergenerational mobility (Solon 1999; Black and Devereux 2013; Corak 2013)
 - Recent estimates for the US (Chetty et al. 2014)
 - Transmission mechanism (Blanden et al, 2007)

Literature Review

- Intergenerational mobility in China
 - Estimates of intergenerational income elasticities for urban China.
 - Intergenerational income elasticities are 0.477 using 1995 CHIPS, 0.508 using CHIPS 2002 (Deng et al.2013)
 - Intergenerational income elasticities is 0.63 for father and son using UHEES 2004 (Gong et al. 2012,)
 - Intergenerational mobility is 0.315 for early cohort, and 0.442 for later cohort using CHIPS 2002 (Yi et al.2015)
 - No estimates of intergenerational income elasticities in rural China.
 - Some research examines intergenerational occupational transmission.

- Children development
 - Nature vs nurture, gene and family environment and investment (Black and Devereux 2013).
 - The formation of non-cognitive and cognitive skill (Heckman et al 2008)
 - Importance of cognitive and noncognitive skills to labor productivity (Heckman et al; Lindquist and Vestman, 2011)
 - Using the first three waves of the GSCF, Glewwe, Huang and Park (2015) find that early cognitive and noncognitive skills influence educational attainment but do not affect early wages independently of years of education.

Contribution

- Lack of intergenerational mobility estimates for developing countries and rural areas.
- Lack of understanding of the role of cognitive and noncognitive skills in explaining intergenerational persistence in such setting.
- Provide estimates from a unique long panel dataset from China, the Gansu Survey of Children and Families (GSCF).
 - Detailed measurements of family income when children was 9-12, 13-16, and 16-19; and children's own income when they were age 24 to 27 when almost all of the children had entered the labor market.
 - No co-residency bias.
 - Detailed measures of cognitive skills and noncognitive skills enables investigation of mediating factors.

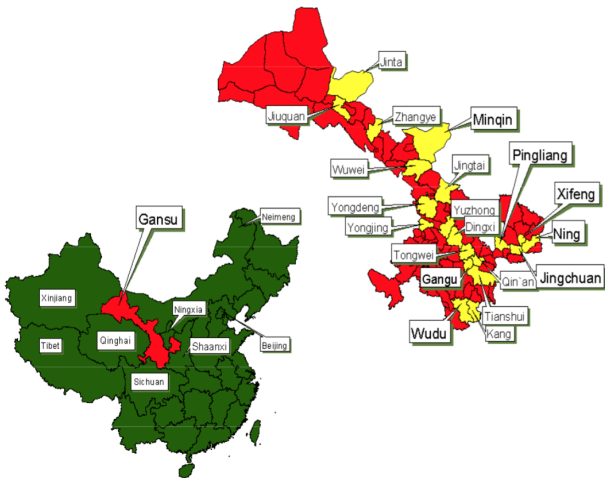


Figure: Sample Location of GSCF

Study Site: Rural Gansu Province

- Located in northwest China.
- Gansu had a population of 25.6 million in 2000, 76 percent of whom resided in rural areas.
- One of China's poorest provinces.
 - Relative to China as a whole, Gansu has low per capita income, high rates of illiteracy, and low per-child educational expenditures.
 - Rural residents primarily work in subsistence farming, animal husbandry, and migrant wage labor.

Data: Gansu Survey of Children and Families

- Panel data that follows a random sample of 2000 children in rural areas of Gansu Province who were 9-12 years old in the year 2000.
- Four waves of surveys were completed in 2000, 2004, 2007-2009 and 2015
- GSCF collected extensive data, with separate questionnaires for children, parents, teachers, school principals and village leaders.
- Sample attrition: All but one of original 2,000 children have complete information in the first wave, including measurements of both cognitive and non-cognitive skills. For the final panel dataset, we have complete information for 924 sample children.

GSCF Skill Measurement

Year	Cognitive Skills	NonCognitive Skills
2000 (wave1)	1. Chinese test 2. Math test 3. Cognitive Skills Test	1. Internalizing behavior 2. Externalizing behavior 3. Educational aspiration
2004 (wave 2)	1. Chinese test 2. Math test 3. Literacy Test	1. Internalizing behavior 2. Externalizing behavior 3. Educational aspiration
2009 (wave 3)	1. Literacy test	1. Rosenberg self-esteem 2. Depressive symptoms
2015 (wave 4)		1. Rosenberg self-esteem 2. Depressive symptoms 3. Big Five Personality

- All scores normalized as standard deviations from sample means.
- All noncognitive skills adjusted using item response theory.

Internalizing and Externalizing Behavior Indices

- Internalizing behavior index: captures the extent to which the child suffers from anxiety, depression and withdrawal.
- Externalizing behavior index: reflects interpersonal interactions, extent of destructive behavior, impulsivity, aggression and over-activity.
- Questions based on scales developed by psychologists (Achenbach and Edelbrock, 1978), adapted to fit Chinese context.

Internalizing Behavior Index Questions	Externalizing Behavior Index Questions
I dont want others to meddle in my own business	I break things on purpose.
I cant concentrate on what I am doing	I lose my temper.
I have many strange / weird ideas (often daydream)	Even if I know I am wrong, I am reluctant to listen to others.
I easily get flushed. (I am easily frustrated or anxious)	I steal things from others or my home.
I cant do things well when my parents are not present	I like to show off my strengths in front of others.
I am very indifferent to others	I always want to be the center of attention.
I am very shy	I quarrel with others.
I always want to be the center of attention	I do not observe school discipline.
I am often teased by classmates	I like to brag.
I do not feel guilty, even if I have done something wrong	It bothers me if others do things better than I do.
My temper changes quickly and easily	I act impulsively.
I feel inferior to others	I often am suspicious of others.
I often am suspicious of others	I often say obscenities.
I prefer to be alone	I often make fun of others.
I often feel nervous	I sometimes tell lies.
I am often bored	I am easily angered.
I stay quiet when I am with my classmates or friends	I often disregard other peoples ideas.
There is always something to worry about	I sometimes menace and even hurt others.

Summary Statistics

Variable	Mean	Std. Dev.	N
Children's income	38888	31853	924
Family net income, average first three waves	13127	16180	924
Father's income, average first three waves	7169	8457	924
Mother's income, average first three waves	3750	5449	924
Parental income per parent	5459	6343	924
Children gender (male=1)	0.568	0.496	924
Children's education year	12.214	3.368	924
Age	25.940	1.168	924
Potential experience	6.656	3.534	924
Father's age in 2000	37.321	4.844	924
Years of schooling of Father	6.527	3.09	924
Years of schooling of Mother	4.153	3.206	924

Note: Data Source: GSCF. Children's income is children's individual income we interviewed in the last wave, Family net income are the average value for the first three waves.

Summary Statistics

Table: Correlation between Cognitive and Noncognitive skills

2000	Internal00	External00	Mcollege00	Chn00	Math00	Cogn00
Internal00	1					
External00	0.851***	1				
Mcollege00	-0.152***	-0.183***	1			
Chn00	-0.132***	-0.153***	0.0944**	1		
Math00	-0.0937**	-0.110***	0.108***	None	1	
Cogn00	-0.268***	-0.280***	0.186***	0.281***	0.221***	1
2004	Internal04	External04	Mcollege04	Math04	Chn04	Literacy04
Internal04	1					
External04	0.761***	1				
Mcollege04	-0.0747*	-0.124***	1			
Math04	-0.0676*	-0.0834*	0.159***	1		
Chn04	-0.0693*	-0.0954**	0.171***	0.492***	1	
Literacy04	0.0423	-0.0463	0.264***	0.270***	0.264***	1

Note: The correlation between chn00 and math00 is none since we randomly choose about half students take math exam, the other half take Chinese in 2000.

Summary Statistics

Table: Correlation between Cognitive and Noncognitive skills

2009	Rosenberg09	Depress09	Literacy09					
Rosenberg09	1							
Depress09	-0.277***	1						
Literacy09	0.225***	-0.0389	1					
2015	Rosenberg15	Depress15	Extraver15	Agreeable15	Consci15	Neurot15	Open15	
Rosenberg15	1							
Depress15	-0.345***	1						
Extraver15	0.416***	-0.216***	1					
Agreeable15	0.412***	-0.212***	0.391***	1				
Consci15	0.433***	-0.213***	0.409***	0.547***	1			
Neurot15	-0.430***	0.430***	-0.393***	-0.323***	-0.373***	1		
Open15	0.121***	-0.0323	0.146***	0.145***	0.158***	-0.0754*	1	

Summary Statistics

Table: Correlation Over time for Skill Measurement

	(00, 04)	(04, 09)	(00, 09)	(09, 15)
Chinese test score	0.141***			
Math test score	0.095**			
Cognitive /Literacy test	0.372***	0.331***	0.438***	
Internalizing scale	0.030			
Externalizing scale	0.094***			
Motivation	0.155***			
Self-esteem Scale				0.276***
Depressive symptoms				0.291***

Note: this table shows the correlation between cognitive skills and noncognitive skills Over time. All the variables are standardized. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Estimating Intergenerational Correlation

- Estimate intergenerational education correlation:

$$\text{Edu}_c = \alpha + \beta \text{Edu}_f + \text{Controls} + \epsilon$$

- Edu_c is children's year of education, Edu_f is father's year of education.
- Estimate intergenerational income correlation:

$$y_c = \alpha + \beta y_f + \text{Controls} + \epsilon$$

- y_c is log children's income or children's income rank, y_f is log family net income or family net income rank.
- β measures the intergenerational correlation: **Traditional IGE vs Rank Rank slope** (Chetty et al. 2014)
- Control variables include children's birth year dummies, father's age, father's age square, and male dummy.

Intergenerational Education Correlation

	(1) Whole	(2) Female	(3) Male
Father's education	0.344*** (0.034)	0.317*** (0.053)	0.362*** (0.046)
Observations	924	399	525

Standard errors in parentheses

Data Source: GSCF, all four waves

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Intergenerational Income Correlation: (log income)

	(1)	(2)	(3)
	Whole	Female	Male
Log HH net income	0.111*** (0.034)	0.048 (0.044)	0.163*** (0.051)
Observations	906	392	514

Drop log household net income top and bottom 1% sample.

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Intergenerational Income Correlation: (Family Income Rank)

	(1)	(2)	(3)
	Whole	Female	Male
HH net income rank	0.103*** (0.031)	0.066 (0.051)	0.148*** (0.043)
<i>N</i>	924	399	525

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Income Transition Matrix

Family Income Group	Children's Income Group				Total
	1	2	3	4	
1	28.76	27.43	23.89	19.91	100.00
2	28.19	22.03	27.31	22.47	100.00
3	26.43	23.79	24.23	25.55	100.00
4	16.37	26.99	24.78	31.86	100.00
Total	24.94	25.06	25.06	24.94	100.00

Note: Transitional matrix between family income group and children's income group. Each group is defined by the quartile of family income or children's income, 1 is the smallest income group and 4 stands for the highest income group.

- The transition pattern is consistent with the low intergenerational income elasticity we estimate above.

Decompose Intergenerational Education Correlation

- Intergenerational education correlation

$$\text{Edu}_c = \alpha + \beta \text{Edu}_f + \epsilon$$

- Impact of father's education on each skill variables

$$H_i = \alpha_{1i} + \lambda_i \text{Edu}_f + u_{1i}$$

- Impact of each skill variables on children's education

$$\text{Edu}_c = \alpha_2 + \sum \rho_i H_i + u_2$$

- The intergenerational correlation can be decomposed into:

$$\beta = \sum \rho_i \lambda_i + \frac{\text{cov}(u_2, \text{Edu}_f)}{\text{Var}(\text{Edu}_f)}$$

Impact of Father's Education on Skills

Panel A: The impact of father's education year on cognitive ability							
	(1) Chn00	(2) Math00	(3) Cogn00	(4) Math04	(5) Chn04	(6) Literacy04	(7) Literacy09
father's years of edu	0.054*** (0.015)	0.034** (0.015)	0.050*** (0.010)	0.022** (0.011)	0.028** (0.011)	0.055*** (0.011)	0.071*** (0.011)
Observations	468	456	924	924	924	924	924

Impact of Father's Education on Skills

Panel B: The impact of father's education year on noncognitive ability 00-09								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Internal00	External00	Mcolleg00	Internal04	External04	Mcollege04	Rosenberg09	Depress09
father's years of edu	-0.033*** (0.011)	-0.033*** (0.011)	0.038*** (0.011)	0.025** (0.011)	0.014 (0.011)	0.060*** (0.011)	0.031*** (0.012)	-0.011 (0.012)
Observations	924	924	924	924	924	924	924	924

Children's Years of Education Determinants

	(1)	(2)	(3)
Chn00	0.384*** (0.148)		0.286** (0.143)
Math00	0.183 (0.150)		0.115 (0.147)
Cogn00	0.486*** (0.131)		0.378*** (0.129)
Math04	0.223* (0.119)		0.181 (0.114)
Chn04	0.198 (0.122)		0.126 (0.119)
Literacy04	0.942*** (0.120)		0.749*** (0.125)
Internal00		-0.096 (0.211)	0.027 (0.203)
External00		-0.267 (0.216)	-0.085 (0.203)
Mcolleg00		0.138 (0.105)	0.008 (0.105)
Internal04		0.277* (0.166)	0.182 (0.156)
External04		-0.217 (0.167)	-0.136 (0.158)
Mcollege04		0.887*** (0.112)	0.622*** (0.110)
Rosenberg09		0.719*** (0.107)	0.548*** (0.106)
Depress09		0.066 (0.106)	0.008 (0.102)
Observations	924	924	924
Adjusted R^2	0.187	0.160	0.240

Data Source: GSCF, all four waves

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

Decomposition results: Education

	(1)	(2)	(3)	(4)	(5)	(6)
Chn00	0.021	6.0			0.015	4.5
Math00	0.006	1.8			0.004	1.1
Cogn00	0.024	7.1			0.019	5.5
Math04	0.005	1.4			0.004	1.2
Chn04	0.006	1.6			0.004	1.0
Literacy04	0.052	15.1			0.041	12.0
Internal00			0.003	0.9	-0.001	-0.3
External00			0.009	2.6	0.003	0.8
Mcolleg00			0.005	1.5	0.000	0.1
Internal04			0.007	2.0	0.005	1.3
External04			-0.003	-0.9	-0.002	-0.6
Mcollege04			0.053	15.5	0.037	10.8
Rosenberg09			0.022	6.5	0.017	4.9
Depress09			-0.001	-0.2	-0.000	-0.0
Explained Cog	0.114	33.0			0.087	25.3
Explained Ncog			0.096	27.9	0.059	17.2
Explained	0.114	33.0	0.096	27.9	0.146	42.5
Unexplained	0.230	67.0	0.248	72.1	0.198	57.5
Total	0.344		0.344		0.344	

Decompose Intergenerational Income Correlation

- Intergenerational income elasticity or rank rank slope

$$y_c = \alpha + \beta y_f + \epsilon$$

- Impact of father's income on each skill variable

$$H_i = \alpha_{1i} + \lambda_i y_f + u_{1i}$$

- Impact of each skill variable on children's income

$$y_c = \alpha_2 + \sum \rho_i H_i + u_2$$

- The Intergenerational correlation can be decomposed into the

$$\beta = \sum \rho_i \lambda_i + \frac{\text{cov}(u_2, y_f)}{\text{Var} y_f}$$

Decompose Intergenerational Income Correlation: Add Children's Education

- Influence of each skill variable on children's outcome.

$$y_c = \alpha_1 + \delta_i H_i + \pi edu_c + u_3$$

- Relationship between log family income and children's educational attainment.

$$edu_c = \alpha_2 + \gamma y_f + u_4$$

- The intergenerational income correlation can be decomposed to

$$\beta = \sum \delta_i \lambda_i + \pi \gamma + \frac{cov(u_3, \ln Y_f)}{var(Y_f)}$$

The conditional contribution of each skill variable is $\delta_i \lambda_i$.

Impact of Log Family Income on Skills

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Chn00	Math00	Cogn00	Math04	Chn04	Literacy04	Literacy09	childeddu
Log family net income	0.182** (0.080)	0.215*** (0.071)	0.203*** (0.050)	0.122** (0.053)	0.010 (0.053)	0.212*** (0.053)	0.172*** (0.057)	0.899*** (0.186)
Observations	459	447	906	906	906	906	906	906

Standard errors in parentheses

Data Source: GSCF, all four waves

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Impact of Log Family Income on Skills

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Internal00	External00	Mcolleg00	Internal04	External04	Mcollege04	Rosenberg09	Depress09
Log family net income	-0.096* (0.052)	-0.087* (0.052)	0.066 (0.054)	0.123** (0.057)	0.124** (0.056)	0.060 (0.055)	0.066 (0.061)	-0.030 (0.055)
Observations	906	906	906	906	906	906	906	906

Standard errors in parentheses

Data Source: GSCF, all four waves

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Impact of Log Family Income on Skills

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Rosenberg15	Depress15	Extraver15	Agreeable15	Conscientious15	Neuroticism15	Open15
Log family net income	0.057 (0.056)	0.027 (0.055)	0.048 (0.054)	0.066 (0.058)	0.081 (0.054)	-0.034 (0.053)	0.080 (0.056)
Observations	906	906	906	906	906	906	906

Standard errors in parentheses

Data Source: GSCF, all four waves

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Children's Log Income Determinants

	(1)	(2)	(3)	(4)	(5)	(6)
Chn00	-0.008		-0.006	-0.011		-0.008
Math00	-0.036		-0.032	-0.037		-0.033
Cogn00	0.062**		0.052**	0.060**		0.050*
Math04	0.006		0.002	0.004		0.000
Chn04	-0.006		0.000	-0.008		-0.001
Literacy04	0.032		0.032	0.027		0.028
Literacy09	0.056**		0.046*	0.045*		0.035
Internal00		-0.115***	-0.094**		-0.116***	-0.097**
External00		0.088**	0.093**		0.094**	0.095**
Mcolleg00		0.004	-0.004		0.001	-0.004
Internal04		0.033	0.026		0.028	0.025
External04		-0.019	-0.015		-0.016	-0.014
Mcollege04		0.005	-0.013		-0.011	-0.018
Rosenberg09		0.015	0.001		0.005	-0.002
Depress09		-0.018	-0.023		-0.021	-0.023
Rosenberg15		0.065**	0.051*		0.057**	0.048*
Depress15		-0.021	-0.019		-0.019	-0.018
Extraver15		-0.013	-0.008		-0.010	-0.007
Agreeable15		-0.001	-0.001		-0.004	-0.002
Conscientious15		-0.011	-0.005		-0.010	-0.005
Neuroticism15		-0.024	-0.014		-0.019	-0.013
Open15		-0.052***	-0.049**		-0.059***	-0.054**
childedu				0.009	0.019***	0.011
Observations	906	906	906	906	906	906
Adjusted R ²	0.079	0.077	0.085	0.080	0.083	0.086

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Decompose Traditional IGE: Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chn00	-0.001	-1.3			-0.001	-1.0	-0.002	-1.8			-0.001	-1.3
Math00	-0.008	-7.0			-0.007	-6.2	-0.008	-7.2			-0.007	-6.4
Cogn00	0.013	11.3			0.011	9.5	0.012	11.0			0.010	9.1
Math04	0.001	0.7			0.000	0.2	0.000	0.4			0.000	0.0
Chn04	-0.000	-0.1			0.000	0.0	-0.000	-0.1			-0.000	-0.0
Literacy04	0.007	6.1			0.007	6.1	0.006	5.2			0.006	5.3
Literacy09	0.010	8.7			0.008	7.1	0.008	7.0			0.006	5.4
Internal00			0.011	9.9	0.009	8.1			0.011	10.0	0.009	8.4
External00			-0.008	-6.9	-0.008	-7.3			-0.008	-7.4	-0.008	-7.4
Mcolleg00			0.000	0.2	-0.000	-0.2			0.000	0.1	-0.000	-0.2
Internal04			0.004	3.7	0.003	2.9			0.003	3.1	0.003	2.8
External04			-0.002	-2.1	-0.002	-1.7			-0.002	-1.8	-0.002	-1.6
Mcollege04			0.000	0.3	-0.001	-0.7			-0.001	-0.6	-0.001	-1.0
Rosenberg09			0.001	0.9	0.000	0.1			0.000	0.3	-0.000	-0.1
Depress09			0.001	0.5	0.001	0.6			0.001	0.6	0.001	0.6
Rosenberg15			0.004	3.3	0.003	2.6			0.003	2.9	0.003	2.5
Depress15			-0.001	-0.5	-0.001	-0.5			-0.001	-0.5	-0.000	-0.4
Extraver15			-0.001	-0.6	-0.000	-0.3			-0.000	-0.4	-0.000	-0.3
Agreeable15			-0.000	-0.1	-0.000	-0.1			-0.000	-0.2	-0.000	-0.1
Conscientious15			-0.001	-0.8	-0.000	-0.4			-0.001	-0.7	-0.000	-0.4
Neuroticism15			0.001	0.7	0.000	0.4			0.001	0.6	0.000	0.4
Open15			-0.004	-3.7	-0.004	-3.5			-0.005	-4.3	-0.004	-3.9
Childeddu							0.008	7.3	0.017	15.4	0.010	8.9
Explained Cog	0.020	18.4			0.018	15.8	0.016	14.5			0.014	12.2
Explained Ncog			0.005	4.9	0.000	0.1			0.002	1.7	-0.001	-0.8
Explained	0.020	18.4	0.005	4.9	0.018	15.9	0.024	21.8	0.019	17.1	0.023	20.3
Unexplained	0.091	81.6	0.106	95.1	0.093	84.1	0.087	78.2	0.092	82.9	0.088	79.7
Total	0.111		0.111		0.111		0.111		0.111		0.111	

Decompose Rank Rank Slope: Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chn00	0.005	4.7			0.005	4.9	0.004	4.2			0.005	4.2
Math00	-0.007	-6.5			-0.007	-6.5	-0.007	-6.7			-0.007	-6.4
Cogn00	0.009	8.6			0.008	7.6	0.008	8.2			0.007	6.8
Math04	0.000	0.1			-0.000	-0.3	-0.000	-0.1			-0.000	-0.4
Chn04	0.000	0.0			0.000	0.0	0.000	0.0			0.000	0.0
Literacy04	0.009	8.5			0.009	8.6	0.008	7.5			0.008	7.4
Literacy09	0.010	10.1			0.009	8.3	0.009	8.4			0.007	6.3
Internal00			0.009	8.3	0.007	6.7			0.009	8.0	0.007	6.6
External00			-0.006	-6.1	-0.007	-6.6			-0.007	-6.3	-0.007	-6.5
Mcolleg00			-0.000	-0.2	-0.001	-0.9			-0.000	-0.4	-0.001	-0.9
Internal04			0.002	2.1	0.002	1.5			0.002	1.6	0.002	1.4
External04			-0.003	-2.8	-0.002	-2.2			-0.003	-2.4	-0.002	-2.1
Mcollege04			0.001	0.6	-0.000	-0.2			-0.000	-0.1	-0.000	-0.4
Rosenberg09			0.003	2.8	0.002	1.7			0.002	1.8	0.002	1.4
Depress09			-0.000	-0.2	-0.000	-0.0			-0.000	-0.0	0.000	0.0
Rosenberg15			0.004	3.5	0.002	2.3			0.003	2.7	0.002	2.0
Depress15			0.000	0.0	0.000	0.0			0.000	0.0	0.000	0.0
Extraver15			-0.001	-1.2	-0.001	-1.0			-0.001	-1.0	-0.001	-0.9
Agreeable15			0.000	0.5	0.001	0.6			0.000	0.3	0.001	0.5
Conscientious15			0.001	1.0	0.001	1.3			0.001	0.9	0.001	1.2
Neuroticism15			0.000	0.5	0.000	0.0			0.000	0.3	-0.000	-0.0
Open15			-0.005	-4.6	-0.004	-4.4			-0.005	-5.0	-0.005	-4.5
Childeddu							0.008	7.7	0.017	15.8	0.009	8.7
Explained Cog	0.026	25.5			0.023	22.6	0.022	21.5			0.019	17.9
Explained Ncog			0.004	4.1	-0.001	-1.1			0.000	0.5	-0.002	-2.2
Explained	0.026	25.5	0.004	4.1	0.022	21.6	0.030	29.2	0.018	16.2	0.026	24.4
Unexplained	0.077	74.5	0.099	95.9	0.081	78.4	0.073	70.8	0.085	79.1	0.077	71.0
Total	0.103		0.103		0.103		0.103		0.103		0.103	

- Sample attrition: using inverse probability weights to correct for sample attrition bias associated with observables.
- Alternative definition for household income: parental income per parent.
- Use principal component to reduce the dimension of skills measurement.
- All results show similar decomposition pattern.

Education Decomposition Results: Using PCA

	(1)	(2)	(3)	(4)	(5)	(6)
Fcog00	0.047	13.6			0.041	11.8
Fcog04	0.046	13.2			0.043	12.4
FNonCog00			0.022	6.3	0.007	2.1
FNonCog04			-0.002	-0.5	-0.001	-0.3
FNonCog09			0.016	4.6	0.012	3.6
Explained	0.092	26.8	0.036	10.4	0.102	29.5
Unexplained	0.252	73.2	0.308	89.6	0.242	70.5
Total	0.344		0.344		0.344	

Income Decomposition: Using Ranks and PCA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fcog00	0.008	7.9			0.007	7.0	0.007	7.0			0.007	6.4
Fcog04	0.003	2.5			0.003	2.5	0.002	1.8			0.002	2.0
Fcog09	0.009	8.5			0.008	7.5	0.007	7.0			0.007	6.5
FNonCog00			0.002	2.2	-0.000	-0.0			0.002	1.5	-0.000	-0.0
FNonCog04			0.000	0.1	0.001	0.5			0.000	0.3	0.001	0.6
FNonCog09			0.002	1.8	0.001	0.9			0.001	1.2	0.001	0.7
FNonCog15a			0.000	0.0	0.000	0.0			0.000	0.0	0.000	0.0
FNonCog15			0.003	3.1	0.002	2.3			0.002	1.9	0.002	1.9
Childed							0.009	8.3	0.015	14.8	0.006	6.2
Explained Cog	0.019	18.9		0.0	0.018	17.1	0.016	15.7			0.015	14.9
Explained Ncog			0.007	7.1	0.004	3.7			0.005	4.9	0.003	3.2
Explained	0.019	18.9	0.007	7.1	0.021	20.8	0.025	24.1	0.020	19.7	0.025	24.3
Unexplained	0.084	81.1	0.096	92.9	0.082	79.2	0.078	75.9	0.083	80.3	0.078	75.7
Total	0.103		0.103		0.103		0.103		0.103		0.103	

Both Family Income and Father's Education



$$y_c = \alpha + \beta_1 y_f + \beta_2 \text{edu}_f + \epsilon$$

- Impact of family income and father's education on skill variables

$$H_i = \alpha_{1i} + \lambda_{1i} y_f + \lambda_{2i} \text{edu}_f + u_{1i}$$

$$y_c = \alpha_2 + \sum \delta_i H_i + u_2$$

- The intergenerational income elasticity can be decomposed to

$$\beta_1 = \sum \delta_i \lambda_{1i} + \frac{\text{cov}(u_2, \hat{y}_f)}{\text{var}(\hat{y}_f)}$$

$$\beta_2 = \sum \delta_i \lambda_{2i} + \frac{\text{cov}(u_2, \hat{\text{edu}}_f)}{\text{var}(\hat{\text{edu}}_f)}$$

Where \hat{y}_f is the residual of regressing y_f on edu_f , and $\hat{\text{edu}}_f$ is the residual of regress edu_f on y_f .

Conditional Intergenerational Correlation

	(1) childdedu	(2) log children's income
Log family net income	0.698*** (0.182)	0.102*** (0.036)
father's years of edu	0.324*** (0.034)	0.014* (0.008)
Observations	906	906

Data Source: GSCF, all four waves, with control variables added.

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

- Conditional on log family net income, the impact of father's years of education on children's years of education is 0.324.
- Conditional on father's years of education, the impact of log family net income on log children's income is 0.102.
- Do the decomposition for these two coefficients.

Decomposition Intergenerational Education Correlation: Conditional on Log Family Income

	(1)	(2)	(3)	(4)	(5)	(6)
Chn00	0.019	5.8			0.014	4.3
Math00	0.005	1.5			0.003	0.9
Cogn00	0.022	6.7			0.017	5.2
Math04	0.004	1.2			0.003	1.0
Chn04	0.007	2.0			0.004	1.4
Literacy04	0.047	14.6			0.037	11.5
Internal00			0.004	1.2	-0.000	-0.1
External00			0.007	2.3	0.003	0.8
Mcolleg00			0.004	1.4	-0.000	-0.0
Internal04			0.007	2.0	0.004	1.3
External04			-0.002	-0.8	-0.002	-0.5
Mcollege04			0.052	15.9	0.036	11.2
Rosenberg09			0.022	6.6	0.017	5.1
Depress09			-0.001	-0.2	-0.000	-0.0
Explained Cog	0.103	31.8			0.079	24.3
Explained Ncog			0.092	28.5	0.057	17.7
Explained	0.103	31.8	0.092	28.5	0.136	42.0
Unexplained	0.221	68.2	0.232	71.5	0.188	58.0
Total	0.324		0.324		0.324	

Decomposition Intergenerational Income Correlation: Conditional on Father's Education

	(1)	(2)	(3)	(4)	(5)	(6)
Chn00	-0.001	-1.2			-0.001	-0.9
Math00	-0.007	-6.8			-0.006	-6.1
Cogn00	0.011	10.7			0.009	9.0
Math04	0.001	0.6			0.000	0.2
Chn04	0.000	0.0			0.000	0.0
Literacy04	0.006	5.6			0.006	5.6
Literacy09	0.007	7.1			0.006	5.9
Internal00			0.009	8.7	0.007	7.1
External00			-0.006	-5.9	-0.006	-6.2
Mcolleg00			0.000	0.2	-0.000	-0.2
Internal04			0.004	3.5	0.003	2.8
External04			-0.002	-2.2	-0.002	-1.7
Mcollege04			0.000	0.1	-0.000	-0.3
Rosenberg09			0.001	0.7	0.000	0.0
Depress09			0.000	0.4	0.001	0.6
Rosenberg15			0.003	2.5	0.002	1.9
Depress15			-0.001	-1.1	-0.001	-1.0
Extraver15			-0.001	-0.6	-0.000	-0.4
Agreeable15			-0.000	-0.1	-0.000	-0.1
Conscientious15			-0.001	-0.7	-0.000	-0.3
Neuroticism15			0.000	0.3	0.000	0.2
Open15			-0.004	-4.0	-0.004	-3.7
Chil dedu						
Explained Cog	0.016	16.1			0.014	13.7
Explained Ncog			0.002	1.9	-0.001	-1.3
Explained	0.016	16.1	0.002	1.9	0.013	12.5
Unexplained	0.086	83.9	0.100	98.1	0.089	87.5
Total	0.102		0.102		0.102	

Income Decomposition using Log(income): Male

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chn00	0.003	1.6			0.004	2.4	0.003	1.8			0.004	2.6
Math00	-0.010	-6.2			-0.010	-6.1	-0.011	-6.7			-0.010	-6.2
Cogn00	0.015	9.2			0.013	7.8	0.014	8.5			0.012	7.4
Math04	-0.003	-1.5			-0.003	-1.7	-0.003	-1.7			-0.003	-1.8
Chn04	-0.001	-0.7			-0.001	-0.8	-0.001	-0.6			-0.001	-0.7
Literacy04	0.006	3.7			0.006	3.9	0.004	2.6			0.005	3.2
Literacy09	0.003	1.8			0.001	0.4	0.000	0.0			-0.002	-1.1
Internal00			0.007	4.4	0.006	3.4			0.007	4.3	0.006	3.5
External00			-0.006	-3.5	-0.005	-3.3			-0.006	-3.5	-0.005	-3.4
Mcolleg00			0.001	0.3	0.000	0.1			0.000	0.3	0.000	0.0
Internal04			-0.001	-0.4	-0.001	-0.7			-0.001	-0.9	-0.002	-0.9
External04			0.005	3.1	0.005	2.8			0.005	3.1	0.005	2.8
Mcollege04			0.001	0.9	-0.000	-0.1			-0.001	-0.3	-0.002	-1.0
Rosenberg09			0.000	0.1	-0.000	-0.0			-0.000	-0.0	-0.000	-0.1
Depress09			-0.000	-0.1	-0.000	-0.1			-0.000	-0.1	-0.000	-0.1
Rosenberg15			0.006	4.0	0.006	3.8			0.005	3.2	0.006	3.4
Depress15			-0.001	-0.8	-0.001	-0.9			-0.001	-0.7	-0.001	-0.8
Extraver15			0.000	0.2	0.000	0.2			0.000	0.2	0.000	0.2
Agreeable15			0.000	0.0	0.000	0.0			0.000	0.0	0.000	0.0
Conscientious15			0.000	0.3	0.001	0.5			0.000	0.3	0.001	0.5
Neuroticism15			0.001	0.5	-0.000	-0.0			0.001	0.4	-0.000	-0.1
Open15			-0.001	-0.6	-0.001	-0.6			-0.001	-0.8	-0.001	-0.7
Childed							0.015	9.3	0.018	10.8	0.015	9.3
Explained Cog	0.013	7.8			0.010	5.9	0.006	4.0			0.005	3.4
Explained Ncog			0.014	8.4	0.008	5.1			0.009	5.4	0.006	3.4
Explained	0.013	7.8	0.014	8.4	0.018	11.1	0.022	13.2	0.026	16.2	0.026	16.1
Unexplained	0.150	92.2	0.149	91.6	0.145	88.9	0.141	86.8	0.137	83.8	0.137	83.9
Total	0.163		0.163		0.163		0.163		0.163		0.163	

Income Decomposition using Log(income): Female

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chn00	-0.007	-13.6			-0.010	-20.4	-0.006	-13.2			-0.010	-20.4
Math00	-0.004	-8.6			-0.001	-1.9	-0.004	-8.6			-0.001	-1.9
Cogn00	0.008	17.3			0.003	6.0	0.008	17.7			0.003	6.0
Math04	0.012	25.9			0.013	26.7	0.012	25.9			0.013	27.1
Chn04	-0.004	-9.2			-0.004	-8.2	-0.004	-9.2			-0.004	-8.2
Literacy04	0.010	21.3			0.009	19.2	0.010	21.8			0.009	19.8
Literacy09	0.020	41.2			0.017	35.2	0.020	42.2			0.017	35.7
Internal00			0.011	23.4	0.008	15.7			0.012	24.3	0.008	15.7
External00			0.001	1.4	0.001	2.2			-0.000	-0.3	0.001	2.2
Mcolleg00			0.000	0.1	-0.001	-1.2			-0.000	-0.1	-0.001	-1.2
Internal04			0.011	23.0	0.009	19.5			0.011	22.3	0.009	19.5
External04			-0.004	-9.1	-0.003	-7.2			-0.004	-8.7	-0.003	-7.2
Mcollege04			-0.000	-0.8	-0.001	-1.7			-0.001	-1.1	-0.001	-1.7
Rosenberg09			0.003	6.6	0.001	2.6			0.003	5.5	0.001	2.6
Depress09			0.003	5.4	0.003	6.8			0.003	5.7	0.003	6.8
Rosenberg15			0.001	2.9	0.001	2.3			0.001	2.7	0.001	2.3
Depress15			0.000	0.1	0.000	0.1			0.000	0.1	0.000	0.1
Extraver15			0.006	12.4	0.007	15.2			0.006	12.1	0.007	15.2
Agreeable15			-0.004	-8.5	-0.005	-9.8			-0.004	-9.1	-0.005	-9.5
Conscientious15			-0.002	-3.5	-0.001	-2.3			-0.002	-3.8	-0.001	-2.3
Neuroticism15			-0.000	-0.2	-0.000	-0.1			-0.000	-0.2	-0.000	-0.1
Open15			-0.011	-22.5	-0.010	-21.7			-0.011	-23.7	-0.010	-21.7
Childeddu							-0.002	-4.0	0.010	21.9	-0.001	-2.0
Explained Cog	0.036	74.4			0.027	56.6	0.037	76.6			0.028	58.0
Explained Ncog			0.015	30.5	0.010	20.4			0.012	25.8	0.010	20.7
Explained	0.036	74.4	0.015	30.5	0.037	77.0	0.035	72.6	0.023	47.7	0.037	76.7
Unexplained	0.012	25.6	0.033	69.5	0.011	23.0	0.013	27.4	0.025	52.3	0.011	23.3
Total	0.048		0.048		0.048		0.048		0.048		0.048	

Gender Difference Results Discussion

- For male, education still explain certain proportion of the intergenerational correlation given the cognitive skills and noncognitive skills. Cognitive and noncognitive skills plays similar role.
- For female, education plays no role in the intergenerational correlation transmission. And cognitive skills is more important than noncognitive skills to explain the intergenerational correlation.
- Similar pattern if we do the rank rank slope decomposition for both gender.
 - Household resource allocation story, the girl are selectively to go to the school, cognitive skills more likely to highly correlated with the girl's education; While boys get more family resource, the education level has less correlation with the cognitive skills.
 - Gender difference in sample attrition pattern.

Conclusions

- The intergenerational Education persistence is 0.344, it's higher for boy than girl.
- The intergenerational Income elasticity is 0.111 for whole sample, also higher for boy than girl.
- **Low intergenerational income correlation in this rural area.**
- Both cognitive and noncognitive skills accounts for certain proportion of intergenerational education correlation.
- The cognitive skills also plays more significant role in the intergenerational income correlation, and noncognitive skills barely plays any role here. Education plays limited role when we conditional on cognitive skills.
- The gender difference pattern.

Future Work

- Correct for the potential estimation bias caused by measurement error.
- Add children's health and labor market attachment variables into this framework.
- Check the differential sample attrition problem by gender.
- Understand the gender difference pattern.
- The role of migration.
- The role of occupation.