

December 2012

Weina Zhou

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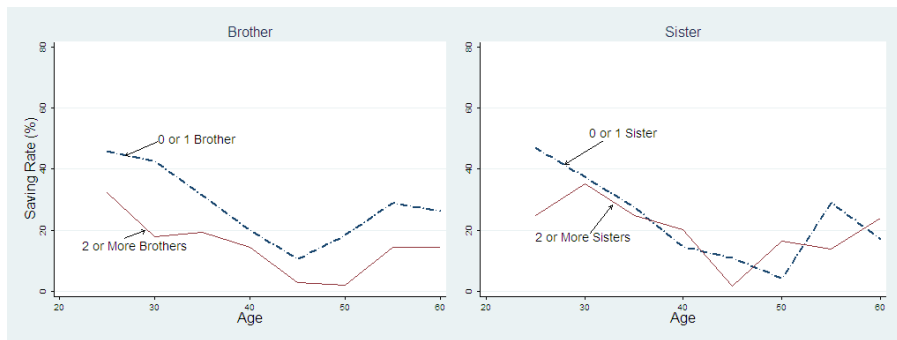
Supporting Parents

Adult children, especially adult male children, are expected to support aging parents

- Evidence of adult male children financially supporting elderly parents: Chao 1994, Jiang 1995, Yang 1996, Lee & Xiao 1998, Ishii-Kuntz 1997, Chen & Silverstein 2000, Tao, Dong, Pratt, Hunsberger 2000, Bean, Bush & McKenry 2003, Sun 2002, Cai & Meng 2006, Banerjee, Meng & Qian 2010 ...
- Affect adult children's household saving rate?
?

Facts

Age profile HH saving rate by number of brothers and sisters



Data: China General Social Survey 2006, 2008

$$SavingRate = 1 - \frac{LivingExpenditure}{DisposableIncome}$$

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Facts

Within province variation



Data: China General Social Survey 2006, 2008

Family Connection: Female-Male Difference

Cultural Norm

- Daughters get married: “Jia Chu Qu”, means married OUT
Sons get married: “Qu xi fu”, means marry IN a daughter in law
- “Wu Lun” (five relationships) defined in the principles of Confucianism: father-son relationship, elder brother-younger brother relationship
Sisters or daughters relationships are not included

Identification - Brothers Effect on HH Saving Rate

- We are interested in α : $Savingrate_i = \alpha bro_i + X_i\beta + \epsilon_i$
- Problem: $E(bro_i \cdot \epsilon_i) \neq 0$
- Solution:
 - For people born before the One Child Policy (1979), hold urban area residence card, use control function approach

$$Savingrate_i = \alpha bro_i + \delta(sib_i) + X_i\beta + \epsilon_i$$
 - For people born after the One Child Policy, use Instrument Variable: Fines for unauthorized birth

Why Brothers Reduce HH Saving Rate? - Test Channels

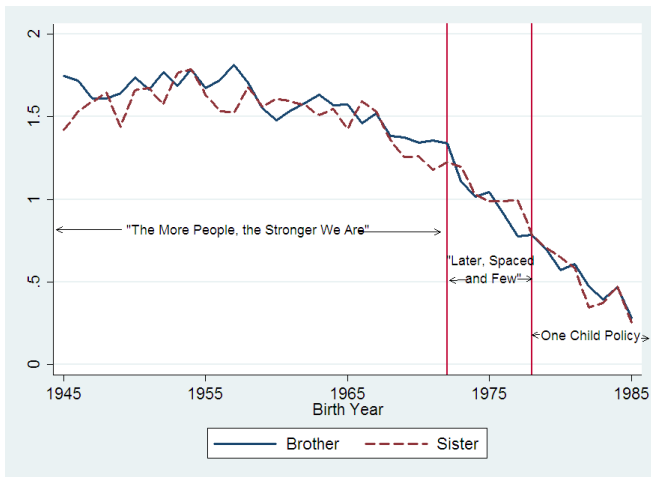
- Supporting parents: use parents' death events
- Risk sharing / extending borrowing limits
 - Income uncertainties and health risks (individual level)
 - Financial development indicators (provincial level)
 - Heterogeneity in income groups

China's Saving Rate Puzzle



Data: China Statistical Year Book

China's Saving Rate Puzzle



Data: China General Social Survey 2006, 2008

Main Results

- One brother reduces saving rate by 5 percentage points
- Reasons brothers reduce saving rate: supporting parents, sharing risks/extending borrowing limit
- The effect of brother in law is two thirds of the effect of brother
- Explained 27.6% of the increased aggregate saving rate during 1990-2005

Discussion

- First paper estimates the sibling effect on saving rate. Other Countries?
- Provide another side effect of China's population policies
- Social security, financial development
- Potential effect of sisters

Outline

1. Data
2. People born before the One Child Policy
 - Control function approach
 - Test channels
 - Additional analysis
 - Brother VS Brother in law
 - Younger brother VS Elder brother
 - Brother effect in different age/cohort
 - Nonlinearity in the brother effect
3. People born after the One Child Policy
 - IV
 - Test channels
4. Saving rate puzzle
5. Conclusion and policy implication

Data

- Micro Data

- China General Social Survey(CGSS) 2006
Hong Kong University of Science and Technology Survey Research Center and Peoples University of China
- Chinese Household Income Project(CHIP)2002
Chinese Academy of Social Science
Borrowing and lending among family members
- China Family Panel Study (CFPS) 2008,2009
Peking University, Institute of Social Science survey (Beijing, Shanghai and Guangdong province)
Borrowing and lending among family members
- Chinese Health and Retirement Longitudinal Study (CHARLS)
Peking University, China Center for Economic Research
Children Supporting parents data

- Provincial Level Year data:

- China Statistical Year Book
National Bureau of Statistics of China
Saving rate, Health
- Almanac of China's Finance and Banking
Financial development data

Definition of Saving Rate

$$SavingRate = 1 - \frac{Expenditure}{DisposableIncome}$$

Expenditure: living expenditure, education expenditure, medical expenditure

Living expenditure: food, clothing, housing, utilities, transportation, miscellaneous (coli.org and National Bureau of Statistics of China)

Survey Structure

- Either female head or male head is surveyed
- Know number of brothers of either female head or male head
- *Female* $\times$ *Brothers* indicate the difference between brothers of female head (brother in law) and brothers of male head

Identification - control function approach

- We are interested in α : $Savingrate_i = \alpha bro_i + X_i\beta + \epsilon_i$
- Problem: $E(bro_i \cdot \epsilon_i) \neq 0$
- Solution:
For people born before the One Child Policy (1979), hold urban area residence card

$$Savingrate_i = \alpha bro_i + \delta(sib_i) + X_i\beta + \epsilon_i$$

- Assumption: $\epsilon_i \perp\!\!\!\perp bro_i | sib_i$

► Proof

Assumption $\epsilon_i \perp bro_i | sib_i$ holds?

Reasons:

- Ultrasound technology was introduced in 1980s
- For urban area residence card holders: good welfare system in Mao's era.
Housing, medical service almost free ("Lao Bao"), 80% of the pre-retirement wage in pension
- Before One Child Policy (1979)
- Non agricultural occupations in urban areas
- Gender equality in Mao's era: "Female is half of the sky"

Identification

Fraction of Male Siblings (Brothers) by Number of Siblings

The natural gender ratio: 106 male/ 100female, fraction of male: 51.5
Grech (2002)

Number of Siblings	Obs	Fraction of Male	95% Conf. Interval	
1	572	0.52	0.50	0.55
2	846	0.52	0.50	0.53
3	756	0.49	0.48	0.51
4 or more	1085	0.48	0.47	0.49

Conditional on Number of Siblings, Is Number of Brothers Random?

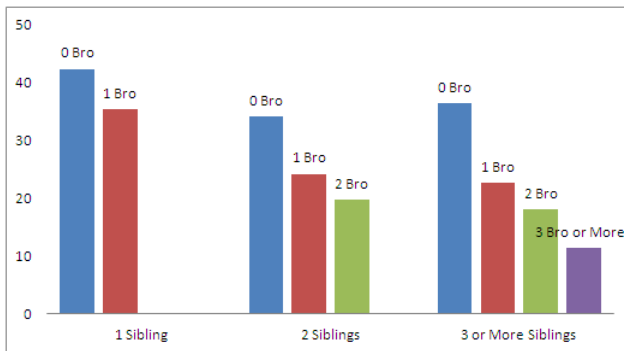
	Dependent Variable		
	Brother	Brother	Fraction
Siblings		0.484*** (0.012)	-.009** (0.005)
Mother Education	-.041*** (0.009)	-.008 (0.006)	-.003 (0.003)
Father Education	-.009 (0.009)	0.009 (0.006)	0.004 (0.003)
Mother Huko	0.048 (0.111)	0.011 (0.082)	-.030 (0.03)
Father Huko	-.227* (0.125)	-.076 (0.096)	0.007 (0.036)
Mother Company Type	-.060 (0.059)	-.041 (0.044)	-.026 (0.02)
Father Company Type	0.073 (0.048)	-.007 (0.035)	-.005 (0.015)
Parents Communist Party	Yes	Yes	Yes
Parents OCC Skill Levels	Yes	Yes	Yes
Parents OCC Dummies	Yes	Yes	Yes
Obs.	2611	2611	2386
Wald statistics	10.46***	1.37	1.45

Standard errors are clustered at province level

* * * $p < 0.01$, * * $p < 0.05$, * $p < 0.1$

Variation

Household saving rate (%) by number of siblings and number of brothers



Brothers Effect on HH Saving Rate

Dependent Variable: Saving Rate						
	(1)	(2)	(3)	(4)	(5)	(6)
Brothers	<i>-.048***</i> (0.017)	<i>-.048***</i> (0.016)	<i>-.046***</i> (0.016)	<i>-.047***</i> (0.016)	<i>-.046***</i> (0.016)	<i>-.057***</i> (0.022)
Female×Brothers						0.024 (0.023)
Siblings	0.011 (0.01)	0.015 (0.01)	0.016 (0.01)	0.017 (0.01)		0.017* (0.01)
Basic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Detailed Backgrounds		Yes	Yes	Yes	Yes	Yes
Children			Yes	Yes	Yes	Yes
Housing				Yes	Yes	Yes
Sibling Dummies					Yes	
Obs.	2581	2540	2540	2503	2503	2503
R ²	0.18	0.186	0.234	0.232	0.237	0.233

Basic Controls: education, female, age, age², household income, marital status, city dummies

Detailed Backgrounds: mother education, father education, number of people in households, communist party membership, senddown

Children Information: number of children, children age group dummies: 0 -6, 6 -18 or 18 -

Housing Information: housing dummy, value of mortgage, value of housing

Brothers Effect on HH Saving Rate

Dependent Variable: Saving Rate						
	(1)	(2)	(3)	(4)	(5)	(6)
Brothers	-0.048*** (0.017)	-0.048*** (0.016)	-0.046*** (0.016)	-0.047*** (0.016)	-0.046*** (0.016)	-0.057*** (0.022)
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Why Brothers Reduce Saving Rate? - Test Channels

Test supporting parents effect: parent death event

Control parental wealth: Both mother and father's characteristics when respondents are 18 years old

- communist party membership status
- one digit occupation dummies
- occupational skill levels
- years of education
- Huko status (rural or urban)

Brothers Effect: Supporting Parents

	Dependent Variable: Saving Rate	
Brothers	-.080*** (0.026)	-.078*** (0.025)
Brothers × # of Parents Deceased	0.026* (0.014)	
Brothers × One Parent Deceased		0.019 (0.029)
Brothers × Two Parent Deceased		0.052* (0.029)
# of Parents Deceased	-.081** (0.034)	
One Parent Deceased		-.085* (0.049)
Two Parents Deceased		-.160** (0.07)
Male Children Presence	-.047** (0.024)	-.048** (0.024)
Parents Live Together	-.106*** (0.038)	-.104*** (0.039)
Obs.	2500	2500
R ²	0.247	0.247

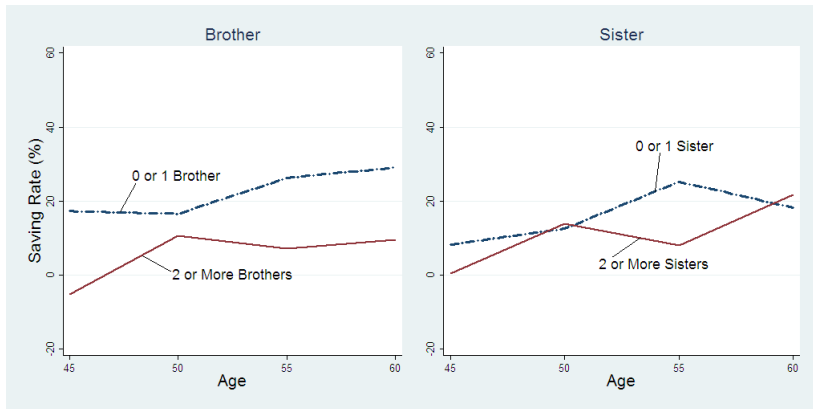
Other variables included: Basic Controls, Detailed Backgrounds, Children Information, Housing Information, Detailed Parents characteristics, Sibling, Female×Brothers (Full Controls)

Brothers Effect: Supporting Parents

	Dependent Variable: Saving Rate	
Brothers	-.080*** (0.026)	-.078*** (0.025)
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Other variables included: Basic Controls, Detailed Backgrounds, Children Information, Housing Information, Detailed Parents characteristics, Sibling, Female×Brothers (Full Controls)

Households Age Profile Saving Rate with No Living Parents



Why Brothers Reduce Saving Rate? - Test Channels

Test risk sharing / extending borrowing limits effect

- Income uncertainties: stability of basic wages and bonus
- Health risks
- Regional financial development
- Heterogeneity among income groups

Risk Sharing / Extend borrowing limits- Uncertainties

	Dependent Variable: Saving Rate	
Brothers × Wage Very Unstable	-.137*** (0.046)	
Brothers × Wage Unstable	-.049 (0.032)	
Brothers × Wage Stable	-.047 (0.032)	
Brothers × Bonus Very Unstable		-.114* (0.065)
Brothers × Bonus Unstable		-.068* (0.037)
Brothers × Bonus Stable		-.039 (0.034)
Obs.	1407	1013
R ²	0.337	0.314

Full Controls, Brothers × # of Parents Deceased are included

▸ wp

▸ bp

▸ risk

Risk Sharing / Extend Borrowing Limits- Uncertainties

Dependent Variable: Saving Rate	
Brothers $\times$ Health Very Poor	-.158** (0.065)
Brothers $\times$ Health Poor	-.127*** (0.031)
Brothers $\times$ Health Normal	-.067*** (0.024)
Brothers $\times$ Health Very Good	-.093** (0.037)
Obs.	2500
R^2	0.254

Full Controls, Brothers $\times$ # of Parents Deceased are included

Sharing Risks/ Extending Borrowing Limits Effect - Regional Financial Development

	Dependent Variable: Saving Rate	
Brothers	-.088*** (0.026)	-.093*** (0.026)
Brothers $\times$ # of Foreign Bank per Capita	0.032*** (0.008)	
Brother $\times$ Insurance Density		0.002*** (0.0008)
Obs.	2500	2500
R^2	0.249	0.248

Full Controls, Brothers $\times$ # of Parents Deceased are included

of Foreign Bank per Capita: Mean 0.24; Unit: 1 branch per 1,000,000 person

Insurance Density: Mean (7.17); Unit: 489 RMB per person



100

Full Controls are included

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Brothers Effect: Heterogeneity in Income

		Dependent Variable: Saving Rate		
		Income All	Income No Living Parents	Asset All
Low	Brothers	-0.233*** (0.034)	-0.190*** (0.059)	-0.107*** (0.029)
	Brothers × # of Parents Deceased	0.054*** (0.020)		
Medium	Brothers	-0.062** (0.028)	-0.04 (0.052)	-0.081*** (0.030)
	Brothers × # of Parents Deceased	0.045** (0.018)		
High	Brothers	0.025 (0.020)	-0.006 (0.041)	-0.06 (0.041)
	Brothers × # of Parents Deceased	0.025* (0.013)		
Obs.		2500	666	2310
R^2		0.323	0.268	0.256

Full Controls are included

Brothers Effect: Heterogeneity in Income

		Dependent Variable: Saving Rate		
		Income All	Income No Living Parents	Asset All
Low	Brothers	-0.233*** (0.034)	-0.190*** (0.059)	-0.107*** (0.029)
	Brothers × # of Parents Deceased	0.054*** (0.020)		
Medium	Brothers	-0.062** (0.028)	-0.04 (0.052)	-0.081*** (0.030)
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High	Brothers	0.025 (0.020)	-0.006 (0.041)	-0.06 (0.041)
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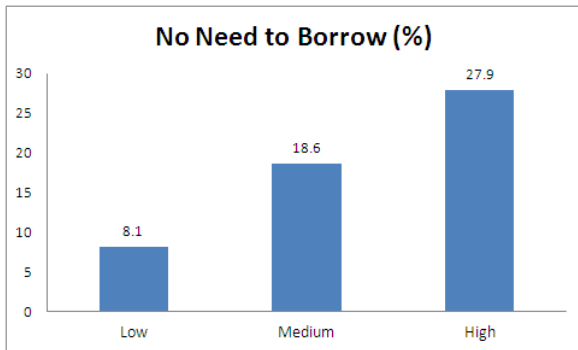
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Obs.		2500	666	2310
R ²		0.323	0.268	0.256

Full Controls are included

Where HH Borrow Money - Heterogeneity in Income

Low income HH are more likely to borrow

“If your household encountered an abrupt difficulty and needed 10000 RMB immediately, who (where) would you turn to firstly?”

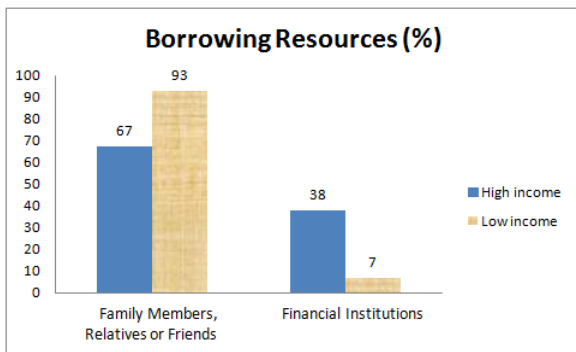


Data: CHIP 2002

Where HH Actually Borrowed Money From?

Low income households are less likely to be able to borrow from bank

Conditional on borrowing, “Where did you borrow money from last year?”



Data: CFPS 2009

Outline

1. Data
2. People born **before** the One Child Policy
 - Control function approach
 - Test channels
 - **Additional analysis**
 - **Brother VS Brother in law**
 - **Younger brother VS Elder brother**
 - **Brother effect in different age/cohort**
 - **Nonlinearity in the brother effect**
3. People born after the One Child Policy
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5. Conclusion and policy implication

Additional Analysis - Brothers VS Brothers in Law

	Dependent Variable: Saving Rate		
	(1)	(2)	(3)
Brothers	-0.047* (0.027)	-0.063* (0.034)	-0.146*** (0.043)
Brothers in Law	-0.029 (0.026)	-0.043 (0.039)	-0.097*** (0.033)
Brothers $\times$ # of Parents Deceased		0.029 (0.018)	
Brothers in Law $\times$ # of Parents Deceased		0.009 (0.022)	
Brothers $\times$ Middle Income Dummy			0.133*** (0.04)
Brothers $\times$ High Income Dummy			0.165*** (0.045)
Brothers in Law $\times$ Middle Income Dummy			0.088*** (0.033)
Brothers in Law $\times$ High Income Dummy			0.138*** (0.033)
Obs.	864	864	864
R^2	0.379	0.371	0.504

Full Controls, Sibling in Law, Number of Parents in Law Deceased are included

Additional Analysis - Brothers Effect in Different Sibling Groups

	Dependent Variable: Saving Rate					
	Sib<3	Sib=3	Sib>3	Sib<3	Sib=3	Sib>3
Brothers	-.088** (0.042)	-.056 (0.038)	-.044 (0.04)	-.336*** (0.066)	-.213*** (0.049)	-.150*** (0.055)
Brothers × Middle Income Dummy				0.22*** (0.054)	0.246*** (0.033)	0.132*** (0.023)
Brothers × High Income Dummy				0.352*** (0.057)	0.318*** (0.034)	0.172*** (0.033)
Brothers × # of Parents Deceased				0.037 (0.04)	-.007 (0.032)	0.011 (0.021)
Obs.	1146	555	802	1146	555	802
R ²	0.264	0.298	0.342	0.311	0.464	0.398

Full Controls are included

Additional Analysis - Brothers Effect in Different Sibling Group

	Dependent Variable: Saving Rate					
	Sib<3	Sib=3	Sib>3	Sib<3	Sib=3	Sib>3
Brothers	-.088** (0.042)	-.056 (0.038)	-.044 (0.04)	-.336*** (0.066)	-.213*** (0.049)	-.150*** (0.055)
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R ²	0.264	0.298	0.342	0.311	0.464	0.398

Full Controls are included

Additional Analysis - Elder Brothers VS Younger Brothers

	Dependent Variable: Saving Rate			
	(All)	(28-40)	(40-50)	(50-60)
Brothers	-.043* (0.023)	-.061*** (0.023)	-.036 (0.053)	0.005 (0.036)
Younger Brothers	-.034* (0.02)	-.011 (0.034)	-.059 (0.044)	-.052 (0.032)
Siblings	0.017 (0.01)	0.025* (0.014)	0.028 (0.019)	-.010 (0.019)
Obs.	2503	1012	804	687
R^2	0.24	0.27	0.345	0.285

Full Controls are included

Additional Analysis - Elder Brothers VS Younger Brothers

	Dependent Variable: Saving Rate			
	(All)	(28-40)	(40-50)	(50-60)
Brothers	-.043* (0.023)	-.061*** (0.023)	-.036 (0.053)	0.005 (0.036)
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Full Controls are included

Additional Analysis - Brothers Effect in Different Age/Cohort

	Dependent Variable: Saving Rate					
	28-40	40-50	50-60	28-40	40-50	50-60
Brothers	-0.065** (0.029)	-0.068 (0.045)	-0.024 (0.038)	-0.172*** (0.031)	-0.196*** (0.059)	-0.251*** (0.074)
Brothers × Middle Income Dummy				0.100*** (0.031)	0.182*** (0.035)	0.174*** (0.038)
Brothers × High Income Dummy				0.177*** (0.021)	0.23*** (0.043)	0.249*** (0.04)
Brothers × # of Parents Deceased				0.077* (0.043)	0.029 (0.028)	0.04 (0.025)
Obs.	1012	804	687	1012	804	687
R ²	0.270	0.333	0.260	0.321	0.409	0.374

Full Controls are included

Age/Cohort

	Dependent Variable: Saving Rate					
	28-40	40-50	50-60	28-40	40-50	50-60
Brothers	-.065** (0.029)	-.068 (0.045)	-.024 (0.038)	-.172*** (0.031)	-.196*** (0.059)	-.251*** (0.074)
Brothers × Middle Income Dummy				0.100*** (0.031)	0.182*** (0.035)	0.174*** (0.038)
Brothers × High Income Dummy				0.177*** (0.021)	0.23*** (0.043)	0.249*** (0.04)
Brothers × # of Parents Deceased				0.077* (0.043)	0.029 (0.028)	0.04 (0.025)
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Identification for People Born AFTER the One Child Policy

IV for number of brothers:

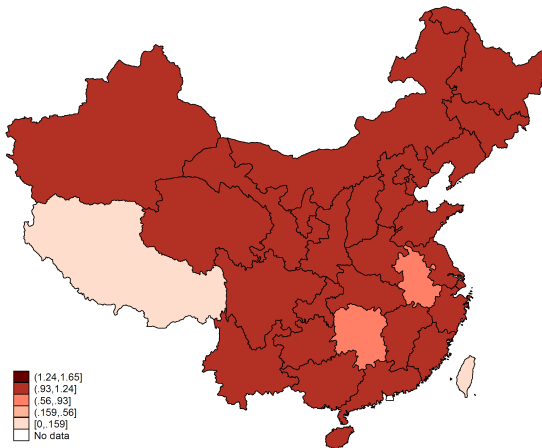
Fines for unauthorized birth (Scharping 2003, Ebenstein 2010)

Typical Fines:

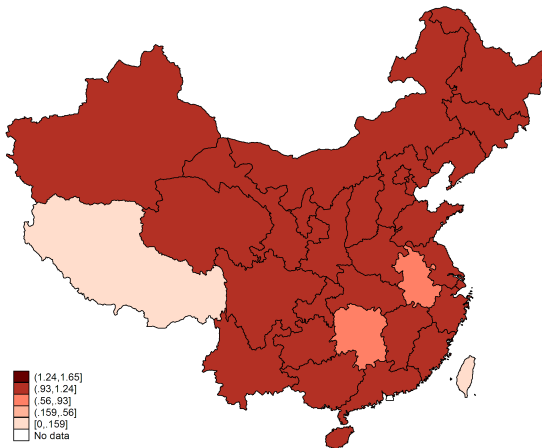
- 10% of annual income of both parents
- 14 years

Variation: temporal variation within province

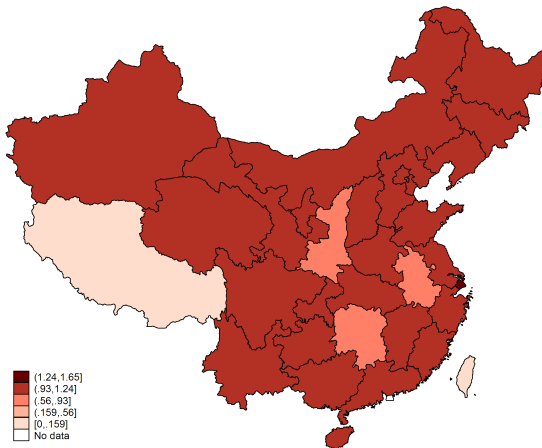
Fine 1979



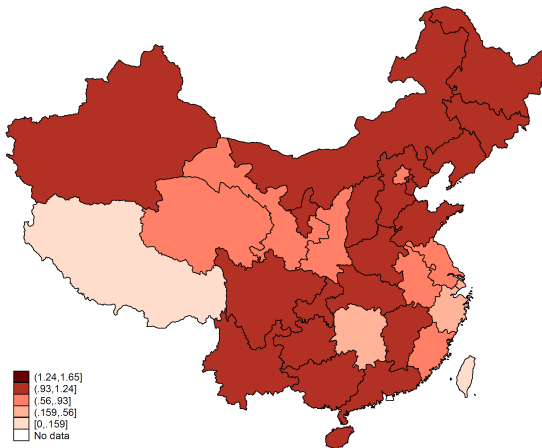
Fine 1980



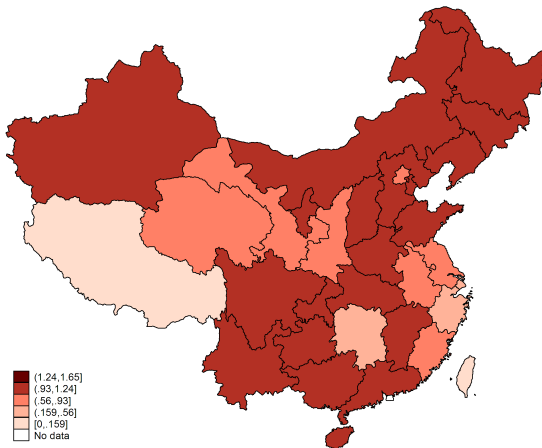
Fine 1981



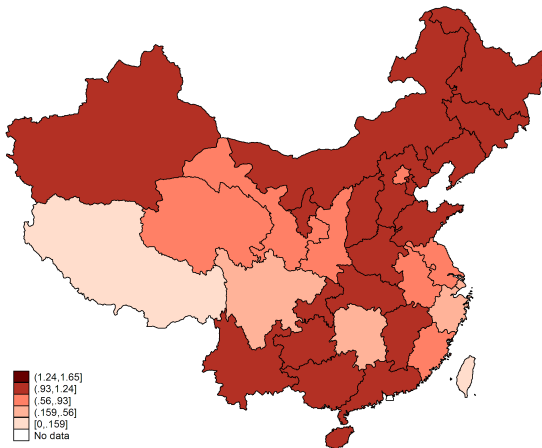
Fine 1982



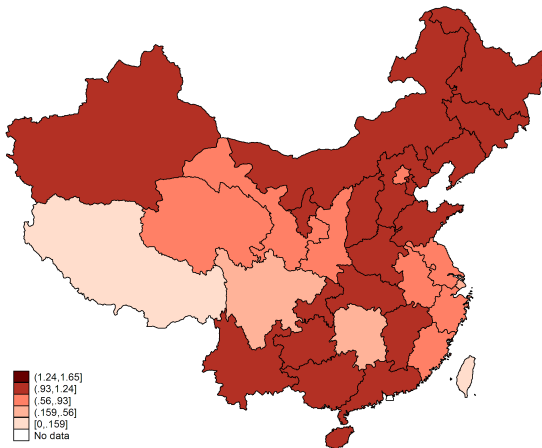
Fine 1983



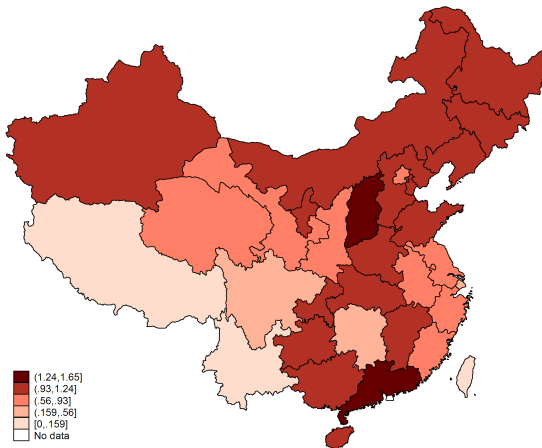
Fine 1984



Fine 1985



Fine 1986



Are Fines Exogenous?

	Dependent Variable	
	$Fines_t$	$Fines_{t+1}$
Population	-.502 (0.618)	-.724 (0.698)
Gender Ratio among Newborns	-.002 (0.003)	0.005 (0.006)
Wage	-.403 (0.339)	-.031 (0.296)
Total Agriculture Product per Capita	0.008 (0.076)	0.046 (0.087)
Total Industry Product per Capita	0.007 (0.019)	0.027 (0.02)
Total Retail Sales per Capita	-.011 (0.029)	-.026 (0.031)
Urbanization rate	0.2 (0.133)	0.137 (0.099)
Price Index	0.002 (0.01)	-.0003 (0.011)
Province Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Obs.	168	140
R^2	0.75	0.846

Brothers Effect on HH Saving Rate

	Dependent Variable					
	Fines (1)	Saving Rate (2-6)				
	1st Stage (1)	2nd Stages (2-6)				
	(1)	(2)	(3)	(4)	(5)	(6)
Brothers	-.779*** (0.269)	-.373** (0.18)	-.359** (0.177)	-.774*** (0.258)		
Brothers × # of Parents Deceased			-.261 (0.676)		0.773 (1.101)	-.620 (2.291)
Brothers × Middle Income Dummy				0.259 (0.251)		
Brothers × High Income Dummy				0.552** (0.261)		
Brothers × Wage Very Unstable					-.556* (0.303)	
Brothers × Wage Unstable					-.372 (0.37)	
Brothers × Wage Stable					-.299 (0.32)	
Brothers × Bonus Very Unstable						-.420 (0.446)
Brothers × Bonus Unstable						-.129 (0.206)
Brothers × Bonus Stable						-.264 (0.49)
Year & Province Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	355	357	355	355	300	236

Full Controls are included

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	(1)	(2)	(3)	(4)	(5)	(6)
Brothers	-0.779***	-0.373**	-0.359**	-0.774***		
		(0.18)	(0.177)	(0.258)		
Brothers × # of Parents Deceased			-0.261		0.773	-0.620
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Brothers Effect on HH Saving Rate

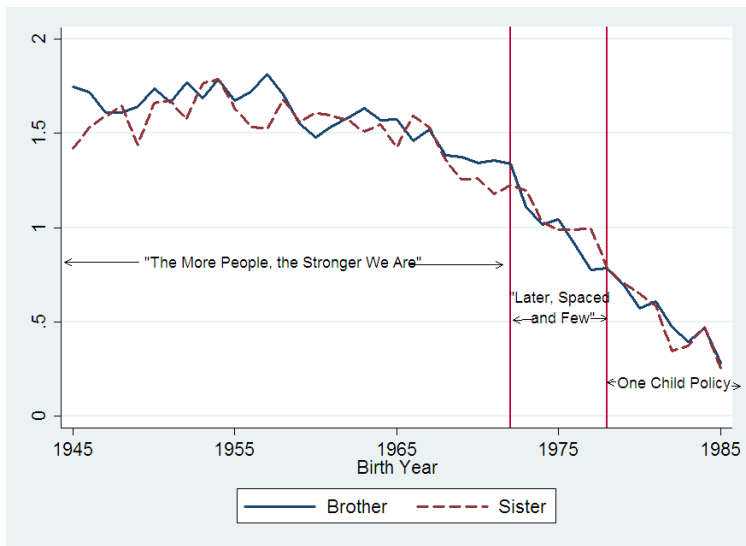
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China's Saving Rate Puzzle

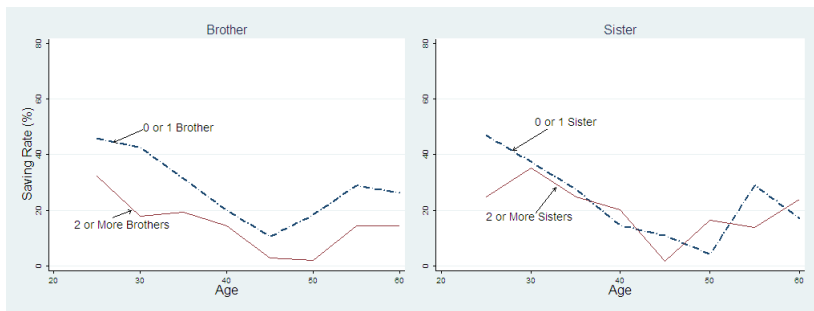


China's Saving Rate Puzzle



Facts

Age Profile Saving Rate by Number of Brothers and Sisters



What if HH in 2005 have same # of brothers as HH in 1990?

- Increased HH aggregate saving rate from 1990 to 2005: 0.08
- Decreased average number of brothers from 1990 to 2005: 0.43
- Brother's effect depend on income, age, number of living parents, marital status

$$\Delta Saving = (Inc \times \widehat{broInc}_{I,A} + Inc_{I,A} \times DP_{I,A} \times \widehat{broDP}_{I,A}) \Delta bro_{I,A}$$

Income: L, M, H

Age: 22-40, 40-50, 50-60

- Change in the number of brothers explained 27.6% of the increased aggregate saving rate

Conclusion

- One brother reduces saving rate by 5 percentage points
- Reasons brothers reduce saving rate: supporting parents, sharing risks/extending borrowing limit
- Explained 27.6% of the increased aggregate saving rate during 1990-2005
- Provide another side effect of China's population policies
Current and future young generation have almost no brothers due to the One Child Policy: they lack a safety net and they carry the huge burden of supporting parents. Developing the HH financial market will be a necessary and urgent issue.

Conclusion

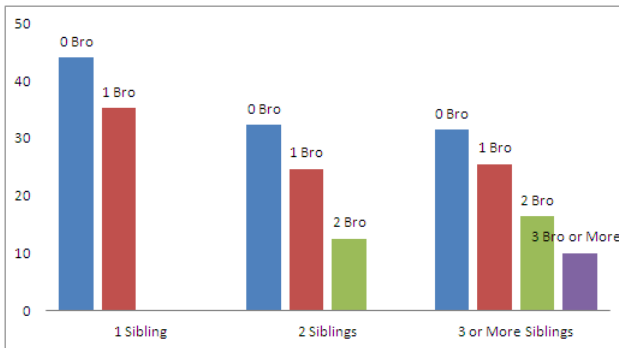
- One brother reduces saving rate by 5 percentage points
- Reasons brothers reduce saving rate: supporting parents, sharing risks/extending borrowing limit
- The effect of brother in law is two thirds of the effect of brother
- Explained 27.6% of the increased aggregate saving rate during 1990-2005

Discussion

- First paper estimates the sibling effect on saving rate. Other Counties?
- Provide another side effect of China's population policies
- Social security
- Financial development
- Potential effect of sisters

Variation

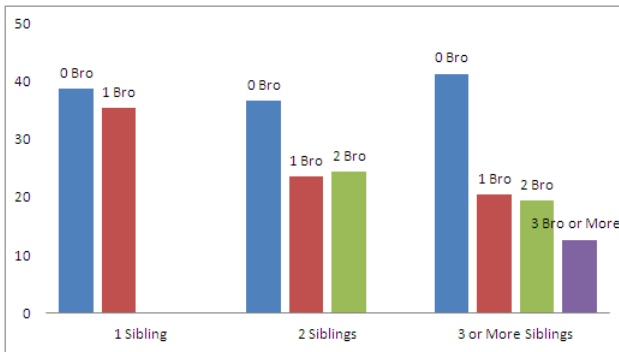
Household saving rate (%) by number of siblings and number of brothers
MALE head



► variation

Variation

Household saving rate (%) by number of siblings and number of brothers
FEMALE head



► variation

Variation

Household saving rate (%) by number of siblings and number of brothers
Not live with Parents



► variation

Financial Development

Financial Development Indicators:

- 1 Foreign Bank: Foreign Bank / pop
Determined by government policies:
Allow banks to set up branches in cities (to operate foreign currency business)
 - 1980s: 4 cities in Guangdong Fujian
 - 1990: Shanghai
 - 1992: Liaoning Shandong, Jiansu, ZheJiang, Fujian, Guodong, Tianjin

For Chinese currency operation, Shanghai 1996

- ② Insurance Density : Insurance premiums / pop

Saving stock - asset

	Dependent Variable Generated Asset Stock
# of brother	-1.987*** (0.550)
# of brother $\times$ Incdy _m	0.622 (0.394)
# of brother $\times$ Incdy _n	1.809** (0.731)
# of brother $\times$ # of parents deceased	0.589* (0.327)
# of brother $\times$ Incdy _m $\times$ # of parents deceased	0.445 (0.275)
# of brother $\times$ Incdy _n $\times$ # of parents deceased	0.546 (0.569)
Observations	2,391
R-squared	0.260

Intertemporal correlation of Fines and Bonuses

Factors Affect the Probability of Being Asked for Lending Money

	Dependent variable
	Lend
Personal income	0.045*** (0.013)
Household's income	-0.004 (0.011)
Female	-0.162* (0.089)
Years of education	-0.004 (0.018)
Marital status	0.055 (0.064)
Female × Marital status	-0.031 (0.101)
Constant	691.092 (522.094)
Observations	4,670

Note: Standard errors are clustered at province level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. CFPS 2008 and 2009 individual survey data is used. Other controls: age group dummies, year dummy, province dummies.

Risk sharing / Extend borrowing limits and supporting parents

Dependent variable: Household saving rate		
Brother × Wage very unstable	-0.137*** (0.046)	-0.073* (0.039)
Brother × Wage unstable	-0.049 (0.032)	-0.040 (0.029)
Brother × Wage stable	-0.047 (0.032)	-0.054 (0.033)
Brother × Wage very unstable × # of Parents Deceased		-0.064 (0.051)
Brother × Wage unstable × # of Parents Deceased		-0.013 (0.038)
Brother × Wage stable × # of Parents Deceased		0.015 (0.021)
Observations	1,407	1,407

Risk sharing / Extend borrowing limits and supporting parents

Dependent variable: Household saving rate		
Brother × Bonus very unstable	-0.114* (0.065)	-0.132* (0.078)
Brother × Bonus unstable	-0.068* (0.037)	-0.082** (0.036)
Brother × Bonus stable	-0.039 (0.034)	-0.021 (0.029)
Brother × Bonus very unstable × # of Parents Deceased		0.030 (0.057)
Brother × Bonus unstable × # of Parents Deceased		0.021 (0.024)
Brother × Bonus stable × # of Parents Deceased		-0.026 (0.031)
Observations	1,013	1,013

Risk sharing / Extend borrowing limits and supporting parents

Dependent variable: Household saving rate		
Brother × Health Very Poor	-0.158** (0.065)	-0.205** (0.094)
Brother × Health Poor	-0.127*** (0.031)	-0.108*** (0.036)
Brother × Health Normal	-0.067*** (0.024)	-0.070*** (0.024)
Brother × Health Very Good	-0.093** (0.037)	-0.085** (0.041)
Brother × Health Very Poor × # of Parents Deceased		0.084* (0.048)
Brother × Health Poor × # of Parents Deceased		0.012 (0.026)
Brother × Health Normal × # of Parents Deceased		0.034** (0.014)
Brother × Health Very Good × # of Parents Deceased		0.019 (0.029)
Obs	2,500	2,500

Proof

$$\begin{aligned} E(\epsilon_i | sib_i, bro_i) &= \int_{\epsilon_i} \epsilon f(\epsilon_i | sib_i, bro_i) d\epsilon_i \\ &= \int_{\epsilon_i} \epsilon f(\epsilon_i | sib_i) d\epsilon_i \\ &= E(\epsilon_i | sib_i) \end{aligned}$$

Since $E(\epsilon_i | sib_i)$ is a function of sib_i , let

$$\tilde{\delta}(sib_i) = E(\epsilon_i | sib_i)$$

$$\begin{aligned} E(Y_i | bro_i, sib_i) &= \alpha bro_i + \beta sib_i + E(\epsilon_i | sib_i, bro_i) \\ &= \alpha bro_i + \beta sib_i + \tilde{\delta}(sib_i) \end{aligned}$$



Definition of Saving Rate

$$SavingRate = 1 - \frac{Expenditure}{Income} \quad (1)$$

Expenditure: living expenditure, education expenditure, medical expenditure
Living expenditure: food&clothing, housing, utilities, transportation, miscellaneous (coli.org)