Spillovers in Childbearing Decisions and Fertility Transitions: Evidence from China

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Motivation

- In social science, longstanding debate on the causes of fertility transitions (Lee, 2015)
  - Structuralist view: economic factors affecting costs and benefits (Notestein, 1953; Becker, 1991)
  - Diffusionist view: cultural norms mediated by social interactions (Coale and Watkins, 1986; Bongaarts and Watkins, 1996)
- Beyond economics/sociology divide, attempts to reconcile both views (Kohler, 2000; Durlauf and Walker, 2001; Munshi and Myaux, 2006)
  - Interplay between incentives and norms crucial to understand differences in historical transitions
  - Economic pre-conditions may be amplified or undermined by social interactions

This paper

- To what extent and through which mechanisms do others influence couples in their fertility decisions?
- We exploit China's family planning policies in the 1970s-80s
  - Only the Han ethnic group is targeted → partial population experiment.
  - Policy exposure varies by cohort and region → difference-in-differences.
- We find large spillovers onto other ethnic groups
  - Reduced form: minority women react to Han-targeting policy, more if there are more Han in their reference group.
  - IV: a woman gives birth to 0.64 fewer children if the average completed fertility in her reference group is reduced by one child.
- Spillovers are driven by:
  - Cultural proximity with the Han → social channel.
  - Higher educational investments → economic channel.

Related literature

- Effects of China's population policies on fertility and other outcomes
  - **One-child policy** (e.g. Li et al., 2005, 2011; Ebenstein, 2010; Huang et al., 2016; Li and Zhang, 2017; Rosenzweig and Zhang, 2009; Liu, 2014; Wang and Zhang, 2018)
  - **"Later, Longer, Fewer" campaign** (Chen and Huang, 2018; Babiarz et al., 2018; Chen and Fang, 2018)
    - Best identification strategy relies on variation in pre-policy fertility levels and staggered adoption
  - **Potential spillover effects often ignored**
    - Ethnic minorities used as a control group (Li et al., 2005, 2011)
- Empirical evidence of peer effects in fertility decisions
  - **Timing of birth** (Lyngstad and Prskawetz, 2010; Ciliberto et al., 2016; Hensvik and Nilsson, 2010; Beam and Shrestha, 2020)
  - **Diffusion of small families in Europe** (Spolaore and Wacziarg, 2019; Daudin et al., 2020)
  - **Fertility spillovers in China** (Li and Zhang, 2009)
    - Different data, time period, fertility outcome, identification strategy.
    - Point estimate of peer effect parameter: 0.5-0.9.
    - No mechanism; no quantification of the role of spillovers in the transition.

Outline

Population policies in China

- 1970: "Later, Longer, Fewer" (LLF) Campaign
  - Later marriage, longer birth interval, fewer children: no more than two.
  - Implementation
    - Provincial family planning leading groups formed between 1970 and 1975
    - Local organizations: enterprise and neighborhood committees, special cadres and barefoot doctors
    - Third-child permits, forced abortions, sterilizations and IUD insertions
    - Sanctions: state controls economic lives (job, land, food, migration)
  - Exemptions to ethnic minority groups (Scharping, 2013)
- 1979: One-Child Policy (OCP)
  - One-child-per-couple rule with stricter control and sanctions
  - All ethnic minority groups exempted between 1979 and 1984; the largest Zhuang group faced stricter birth control after 1984
  - Gradually relaxed in recent years. Universal 2-child policy since 2016.

Ethnic groups in China

- Han Chinese represent over 90% of the population.
- 55 ethnic minority groups.
- In 1990, close to 100M people.

		Cultural integration	
		Strong	Weak
Labor market competition	Strong	Man, Tujia, Li	Mongol, Korea
	Weak	Hui, Miao, Dong, Hani, She, Lisu, Va, Daur, Blang, Yao, Sui, Maonan	Zhuang, Tibetan, Uyghur, Buyei, Kazak, Bai, Dai, Dongxiang, Jingpo, Xibe Yi, Kirgiz, Naxi

- Cultural dimension: linguistic distance and residential segregation
- Economic dimension: Han-dominated and education-intensive jobs
- Consistent with demographic classifications (Poston and Gu, 1987)

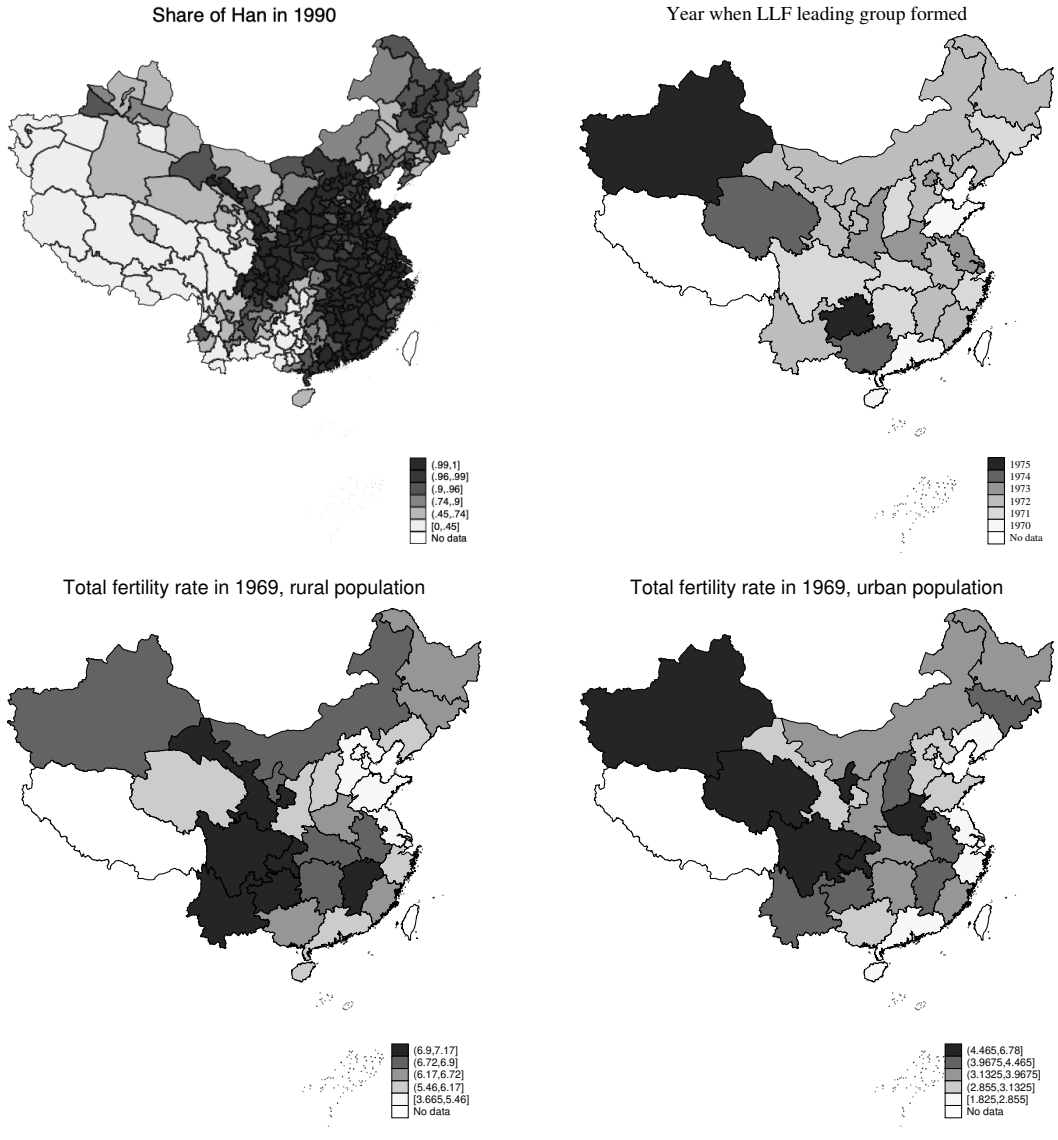
Outline

Data

- Data sources:
  - 1% sample of the 1990 Population Census data
  - 1% sample of the 1982 Population Census data
  - 20% sample of the 2005 Mini-Census data
  - Age-specific fertility rates in 1969 (Coale and Chen, 1987)
  - Provincial time series data 1951–1970 (National Bureau of Statistics of China, 2010)
- Samples:
  - Econometric analysis: all women aged 45 to 64, born between 1926 and 1945 from the 1990 census
  - Descriptive evidence: all women aged 45 to 64, born between 1918 and 1960 from three censuses
- Variables
  - Outcome variable: completed fertility
  - Explanatory variables: expected fertility reduction and local Han share

Summary statistics

Sources of variation in treatment exposure



Source: Authors' own calculation based on the 1% sample of the census 1990; Chen and Fang (2018); Coale and Chen (1987).

Histogram

Expected fertility reduction under LLF

Table 1: Examples of constructing the measure of policy exposure

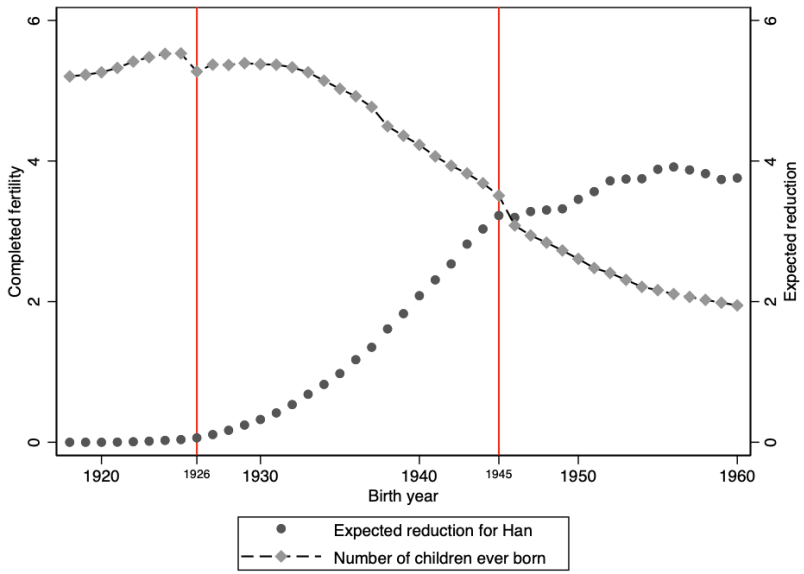
	Jiangsu, rural		Xinjiang, rural		Xinjiang, urban	
Birth Year	1930	1945	1930	1945	1930	1945
AFR(15-19)	0.026	0.026	0.15	0.15	0.008	0.008
AFR(20-24)	0.248	0.248	0.317	0.317	0.296	0.296
AFR(25-29)	0.296	0.296	0.341	0.341	0.29	0.29
AFR(30-34)	0.205	0.205	0.259	0.259	0.166	0.166
AFR(35-39)	0.142	0.142	0.146	0.146	0.142	0.142
AFR(40-44)	0.070	0.070	0.113	0.113	0.076	0.076
AFR(45-49)	0.008	0.008	0.046	0.046	0.076	0.076
TFR in 1969	4.975	4.975	6.86	6.86	5.27	5.27
Policy year	1973	1973	1975	1975	1975	1975
Policy fertility	2	2	2	2	2	2
Age in policy year	43	28	45	30	45	30
Number of children already born	4.951	2.258	6.63	4.04	4.89	3.136
Number of children to be born	0.024	2.717	0.23	2.82	0.38	2.134
ER	0.024	2.717	0.23	2.82	0.38	2.134

Note: Provincial fertility data are taken from Coale and Chen (1987). The measure of policy exposure, ER, coincides with the number of children to be born in the absence of any family planning policies Chen and Fang (2018).

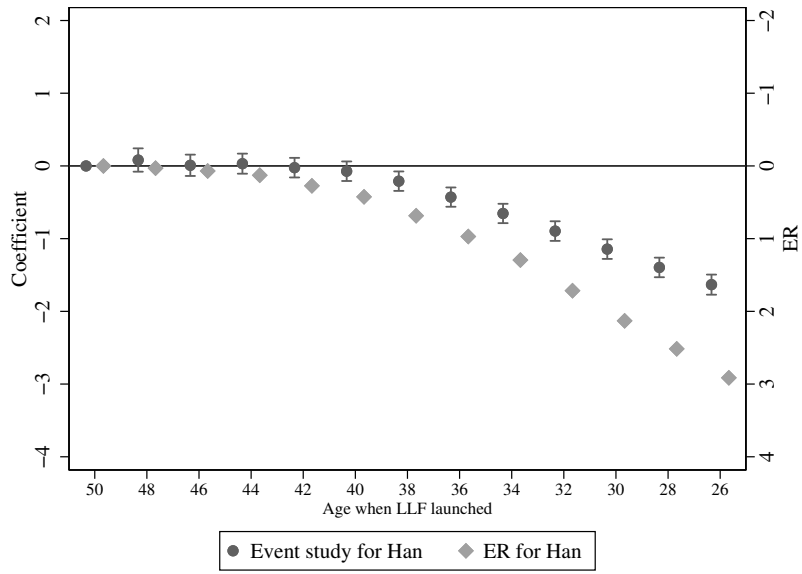
Formula Map: initial fertility Map: rollout

Descriptive evidence - Han Chinese

Evolution over time



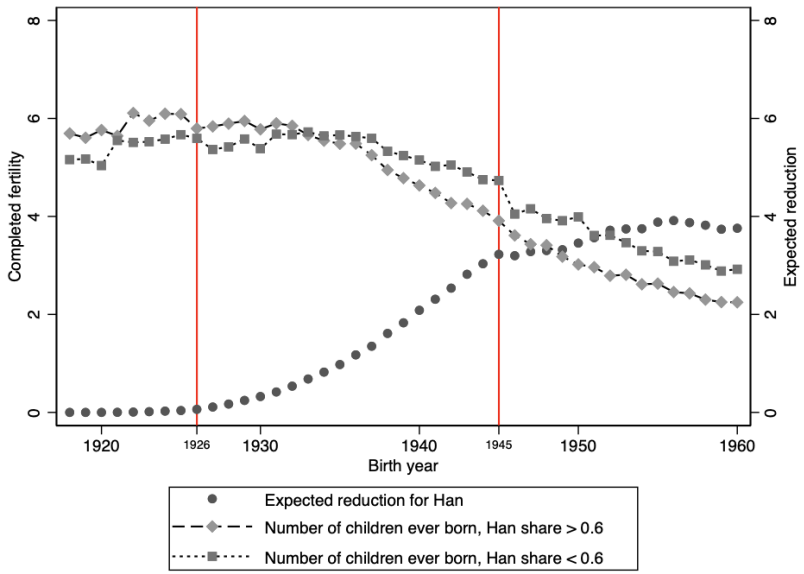
Event study



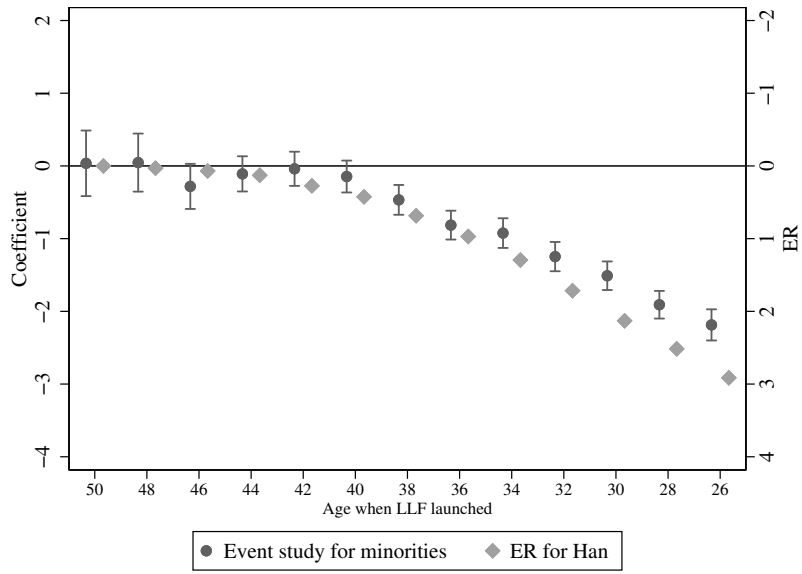
Note: Completed fertility is calculated based on the 1% sample of the 1982 and 1990 censuses and the 20% of the 2005 mini-census. Expected fertility reduction are constructed with provincial fertility data from Coale and Chen (1987).
The event study estimate for Han represents the difference in completed fertility of women aged t-1 or t relative to women aged 50 or 51 when LLF was implemented in the province of living.

Descriptive evidence - Minority Chinese

Evolution over time



Event study



Note: Completed fertility is calculated based on the 1% sample of the 1982 and 1990 censuses and the 20% of the 2005 mini-census. Expected fertility reduction are constructed with provincial fertility data from Coale and Chen (1987).
The event study estimate for minorities represents the partial correlation between the share of Han in the reference group and completed fertility for minority women aged t-1 or t when LLF was implemented.

Outline

Empirical strategy

Difference-in-differences:

$$y_i = \rho \mathrm{ER}_{rpc(i)} + \beta X_i + \lambda Z_{rpc(i)} + \eta_{c(i)} + \mu_{rd(i)} + t_{rp(i)}c + \varepsilon_i$$

$$y_i = \rho_0 \mathrm{ER}_{rpc(i)} + \phi s^H_{rd(i)} \mathrm{ER}_{rpc(i)} + \beta X_i + \lambda Z_{rpc(i)} + \eta_{c(i)} + \mu_{rd(i)} + t_{rp(i)}c + \varepsilon_i$$

- y_i: completed fertility of woman i
- μ_{rd}: prefecture-*hukou* fixed effects.
- η_c: cohort fixed effects.
- Z_{rpc}: province-specific characteristics when the respondents turned 25
  - Density, log(GDP/cap), number of schools/hospitals/health worker p.c.
- X_i: individual characteristics
  - Ethnicity and education
- $t_{rp}c$: province-*hukou* specific linear time trends.
- s^H_{rd}: Han share at the prefecture-*hukou* level

Common trend assumption: in the absence of family planning policies, the changes in fertility outcomes across cohorts would be the same for all prefecture-hukou groups, conditional on covariates and linear trends.

Estimation results

Table 2: Effects of family planning policies on completed fertility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. var.	Completed fertility							
Sample	Han	Minority						
				Potentially heterogenous direct effect				Other events
Exposure (ER)	-0.239***	-0.142	-0.022	-0.021	-0.042	-0.381*	-0.412*	0.064
	(0.042)	(0.158)	(0.157)	(0.217)	(0.218)	(0.230)	(0.233)	(0.168)
Han share × Exposure ($s^H_{rd} \times$ ER)			-0.208***	-0.208***	-0.212***	-0.134***	-0.183***	-0.203***
			(0.043)	(0.044)	(0.044)	(0.044)	(0.067)	(0.044)
Baseline controls and fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	No	No	No	s^H_{rpc}ER	s^H_{rpc}ER	s^H_{rpc}ER	s^H_{rpc}ER	Famine
					W_iER	W_iER	W_iER	Send-down
						$\bar{W}_{rd}$ER	$\bar{W}_{rd}$ER	Cultural Revolution
							$rank_{rd}$ER	
Average policy effect, cohort 1945	-0.8 births		-0.3 births					
R^2	0.234	0.173	0.173	0.173	0.173	0.174	0.174	0.173
Number of clusters	1120	1010	5514	5514	5514	5514	5514	5514
Mean dep var	4.561	5.075	5.075	5.075	5.075	5.075	5.075	5.075
Observations	785479	58887	58887	58887	58887	58887	58887	58887

Note: Robust standard errors in parentheses are clustered at the province-*hukou*-cohort level in columns (1), (2) and at the prefecture-*hukou*-cohort level in columns (3), (4), (5), and (6). W_i: *hukou*, literacy, and high school dummies.

- Total effect on Han: a reduction by $0.235 \times 3.3 = 0.8$ births, 50% of total reduction
- Spillovers on minority:
  - No effect if local Han share=0
  - Average effect: a reduction by $0.22 \times 0.47 \times 3.3 = 0.3$ births, 40% of total reduction

Robustness checks

- Pre-trends Pre-trends
- Non-linear effects Linearity
- Alternative ways to construct ER National ASFR and Binary ER
- Scope for heterogeneous treatment effects Negative weights
- Remove province-specific time trends Without trends
- Other fertility outcomes Sex ratio

Outline

Conditions of existence

- An economic channel
  - Q-Q trade-off among Han: reduction in fertility → increase in educational investments
  - Minority parents keep up with the Han by raising own educational investments
  - Testable by looking at educational outcomes QQ trade-off
  - True in groups working in Han-dominated and education intensive jobs
- A social channel
  - Non-testable because minorities' real social networks not observable
  - Postulate that linguistic distance and residential segregation reduce social interactions
- Other potential mechanisms
  - Female labor force participation: no evidence (Zhang, 2017; Guo et al., 2018)
  - Social learning about birth control: unlikely (Scharping, 2013)

Heterogenous effects on fertility

Table 3: Spillover effects, by economic and cultural integration

Dep. var.: completed fertility of minorities	(1)	(2)	(3)
Economic channel: labor market competition with Han			
Weak × Han share × Exposure	-0.181***		
	(0.043)		
Strong × Han share × Exposure	-0.363***		
	(0.053)		
Social channel: cultural integration with Han			
Weak × Han share × Exposure		-0.046	
		(0.048)	
Strong × Han share × Exposure		-0.302***	
		(0.044)	
The interplay of both channels			
No channel × Han share × Exposure			-0.038
			(0.051)
Only economic channel × Han share × Exposure			-0.147**
			(0.072)
Only social channel × Han share × Exposure			-0.271***
			(0.045)
Both channels × Han share × Exposure			-0.435***
			(0.053)
R^2	0.173	0.174	0.174
Number of clusters	5514	5514	5514
Observations	58887	58887	58887

Outline

A partial population experiment

- Standard linear-in-means model of peer effects (Manski, 1993)
- Fertility outcomes of minority (M) and Han (H) Chinese:

$$y_i^M = \alpha + \beta X_i^M + \gamma \bar{X}_{rdc(i)} + \lambda V_{rdc(i)} + \theta \bar{y}_{rdc(i)} + \varepsilon_i^M$$
$$y_i^H = \alpha + \beta X_i^H + \gamma \bar{X}_{rdc(i)} + \lambda V_{rdc(i)} + \theta \bar{y}_{rdc(i)} + \delta \mathrm{ER}_{rpc(i)} + \varepsilon_i^H$$

  - Reference group *rdc*
  - V_{rdc}: includes all contextual variables, fixed effects and trends
  - θ: spillover parameter / endogenous peer effects
  - δ : direct effect of family planning policy on Han.
- The mean equilibrium outcome in the reference group satisfies:

$$\bar{y}_{rdc} = \frac{\alpha}{1-\theta} + \frac{\beta+\gamma}{1-\theta}\bar{X}_{rdc} + \frac{\lambda}{1-\theta}V_{rdc} + \frac{\delta}{1-\theta}s_{rd}^H \mathrm{ER}_{rpc}$$

- Reduced-form approach identifies $\phi = \dfrac{\theta\delta}{1-\theta}$
- IV approach to separately identify θ and δ

Identification of the spillover effect θ

- Instrument $\bar{y}$ by s^HER in the Minority sample
- First stage:

$$\bar{y}^{(-i)} = \psi s^H_{rdc(i)} \mathrm{ER}_{rpc(i)} + \tilde{\beta} X^M_i + \tilde{\gamma} \bar{X}_{rdc(i)} + \tilde{\lambda} V_{rdc} + \tilde{\varepsilon}_i$$

- Second stage:

$$y^M_i = \theta \bar{y}^{(-i)} + \beta^* X^M_i + \gamma^* \bar{X}_{rdc(i)} + \lambda^* V_{rdc} + \varepsilon^*_i$$

- $\bar{y}^{(-i)}$ average fertility excluding woman i in reference group rdc.
- Validity of the IV approach under two conditions:
  - There is a direct effect of family planning policies on the Han fertility: $\psi = \dfrac{\delta}{1-\theta} \neq 0$
  - Conditional on covariates, the instrument $s^H_{rdc} ER_{rpc}$ influences the minorities fertility only through the average group fertility.

Identification of the direct effect δ

- Compare responses of Han and Minority holding social interactions constant
- IV strategy pooling Han and Minority samples

$$y_i = \alpha + \beta X_i + \gamma \bar{X}_{rdc(i)} + \lambda V_{rdc(i)} + \theta \bar{y}_{rdc(i)} + \delta \mathbb{1}\{Han_i\} \mathrm{ER}_{rpc(i)} + \varepsilon_i$$

- Within-group strategy pooling Han and Minority samples

$$y_i - \bar{y}_{rdc(i)} = \beta(X_i - \bar{X}_{rdc(i)}) + \delta(\mathbb{1}\{Han_i\} - s^H_{rd(i)}) \mathrm{ER}_{rpc(i)} + \varepsilon_i$$

- δ is the coefficient on the Han dummy

Estimation results

Table 4: Estimating the spillover effect θ and the direct effect δ

	(1)	(2)	(3)	(4)	(5)
Sample	Minority			Han and Minority	
Dep. var.	y^M	$\bar{y}^{(-i)}$	y^M	y_i	$y_i - \bar{y}^{(-i)}$
	RF	FS	IV	IV	Within-group
Han share × Exposure	-0.190***	-0.302***			
	(0.042)	(0.030)			
Group average fertility (θ)			0.630***	0.602***	
			(0.103)	(0.080)	
Han dummy × Exposure (δ)				-0.084***	
				(0.024)	
(Han dummy - Han share) × Exposure (δ)					-0.072***
					(0.013)
R^2	0.174	0.849	0.166	0.231	0.017
Number of clusters	5514	5514	5514	12642	12642
Mean dep var	5.075	5.075	5.075	4.597	4.597
F statistics			102.981	78.050	
Observations	58887	58887	58887	844138	844138

- $\theta = 0.64 \rightarrow$ a minority woman reduces her completed fertility by 0.64 births when the group average fertility is reduced by one $\rightarrow$ social multiplier $= 1/(1-\theta) = 3$
- $\delta = -0.08 \rightarrow$ total effect on Han $= -0.24 = 3 \times \delta \rightarrow$ social multiplier=3

Robustness checks

- Potential direct effect Direct effect
- Ethnicity reclassification Reclassification
- Alternative definition of the reference group Reference group
- Estimate intra- and inter-ethnicity spillovers Heterogeneous spillovers

Outline

Conclusion

- This paper provides empirical evidence of large spillovers in fertility decisions in China.
- Spillovers are likely to operate through both economic and social channels.
- Understanding how the interplay of economic and social factors may shape fertility transitions is important for:
  1. Understanding the past
     - General view: strong role of policy (vs. socio-economic development) in explaining fertility decline in the 70s → "induced fertility transition"
     - Our claim: impact of policy magnified by a social multiplier
  2. Predicting the future
     - Current puzzle: expected baby boom after introduction of universal 2-child policy in 2016 did not happen.
     - Potential explanation: multiple equilibria may generate a low fertility trap

Thank you!

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Summary statistics

	Minority sample		Han sample	
	Mean	SD	Mean	SD
Completed fertility	5.075	2.380	4.561	1.985
Completed fertility for 1926 cohort	5.205	2.595	4.913	2.393
Completed fertility for 1945 cohort	4.485	2.116	3.580	1.403
Reference group average fertility ($\bar{y}^{(-i)}$)	5.062	0.970	4.562	0.976
Expected reduction for Han women (ER)	1.569	1.224	1.481	1.257
ER under LLF	1.568	1.224	1.480	1.258
ER under OCP	0.001	0.006	0.001	0.007
ER for 1926 cohort	0.063	0.046	0.070	0.060
ER for 1945 cohort	3.393	0.955	3.286	1.199
Han Share (s^H)	0.491	0.313	0.963	0.100
Han Share x ER	0.754	0.823	1.425	1.230
Age in 1990	53.458	5.617	53.802	5.668
Rural *hukou*	0.851	0.357	0.766	0.423
Literate	0.299	0.458	0.390	0.488
Ever attend junior high school	0.079	0.269	0.118	0.323
Ever attend senior high school	0.027	0.161	0.042	0.200
Ever obtain vocational education	0.012	0.107	0.016	0.125
Ever attend college	0.006	0.075	0.010	0.100
Zhuang	0.202	0.401		
Hui	0.104	0.306		
Man	0.091	0.288		
Miao	0.079	0.270		
Uyghur	0.078	0.268		
Tujia	0.074	0.262		
Yi	0.069	0.254		
Mongol	0.044	0.205		
Tibetan	0.035	0.183		
Buyei	0.033	0.178		
Yao	0.028	0.166		
Dong	0.026	0.158		
Korean	0.024	0.154		
Bai	0.024	0.154		
Other ethnic groups	0.089	0.284		
Observations	58887	785479		

Expected fertility reduction under LLF and OCP

$$\text{ER LLF}^{H}_{rpc} = \begin{cases} 0 \text{ if } TFP_{rp} - \text{LLF fertility}_{rp} \leq 0 \\ \max\{\sum_{a=15}^{49} AFR_{rp}(a) \cdot I[c + a \geq LLF_p, 1990 - c \geq a], \\ \qquad TFR_{rp} - \text{LLF fertility}_{rp}\} \text{ if otherwise} \end{cases} \tag{1}$$

$$\text{ER OCP}^{H}_{rpc} = \begin{cases} 0 \text{ if } \widetilde{TFR}_{rp} - \text{OCP fertility}_{rp} \leq 0 \\ \max\{\sum_{a=15}^{49} \widetilde{AFR}_{rp}(a) \cdot I[c + a \geq OCP_p, 1990 - c \geq a], \\ \qquad \widetilde{TFR}_{rp} - \text{OCP fertility}_{rp}\} \text{ if otherwise} \end{cases} \tag{2}$$

- r hukou, p province, c cohort

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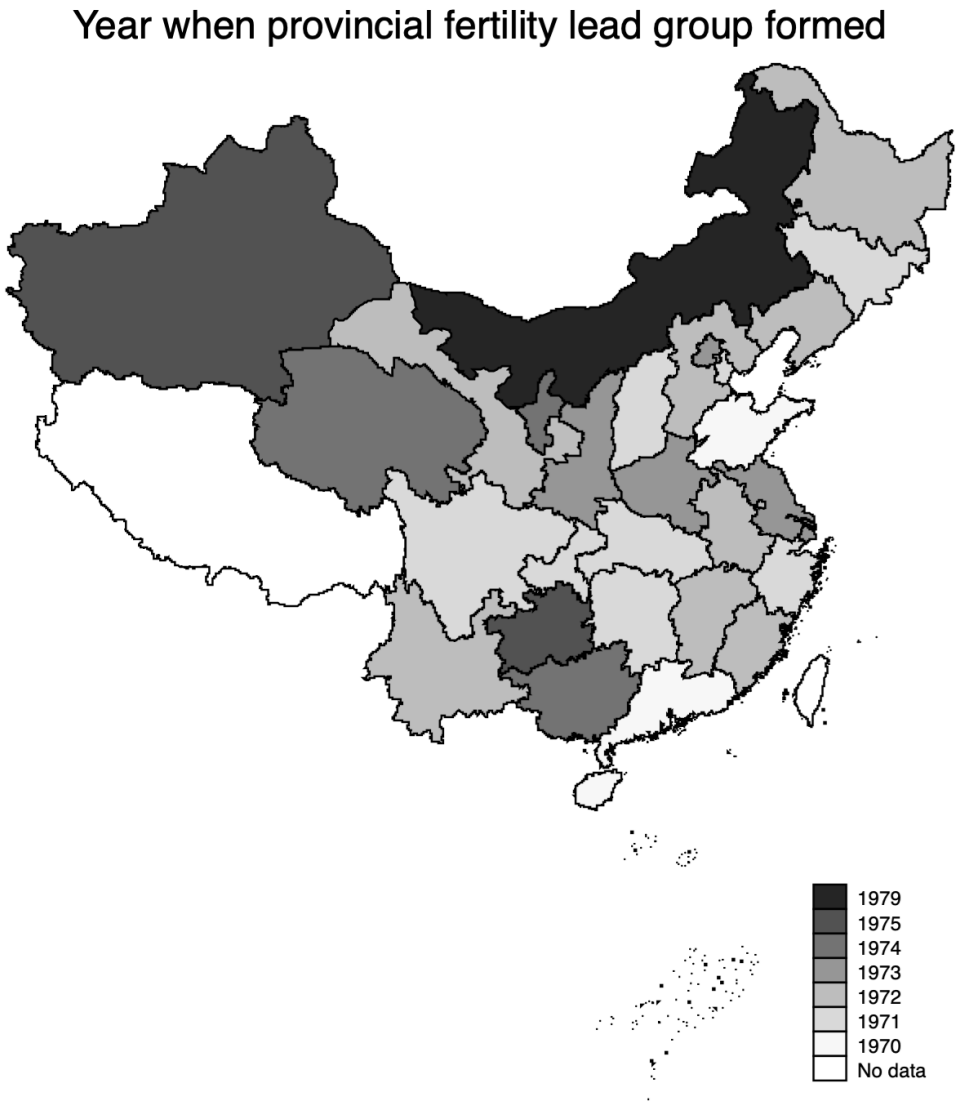
Provincial fertility leading groups



Sources: Chen and Fang (2018)

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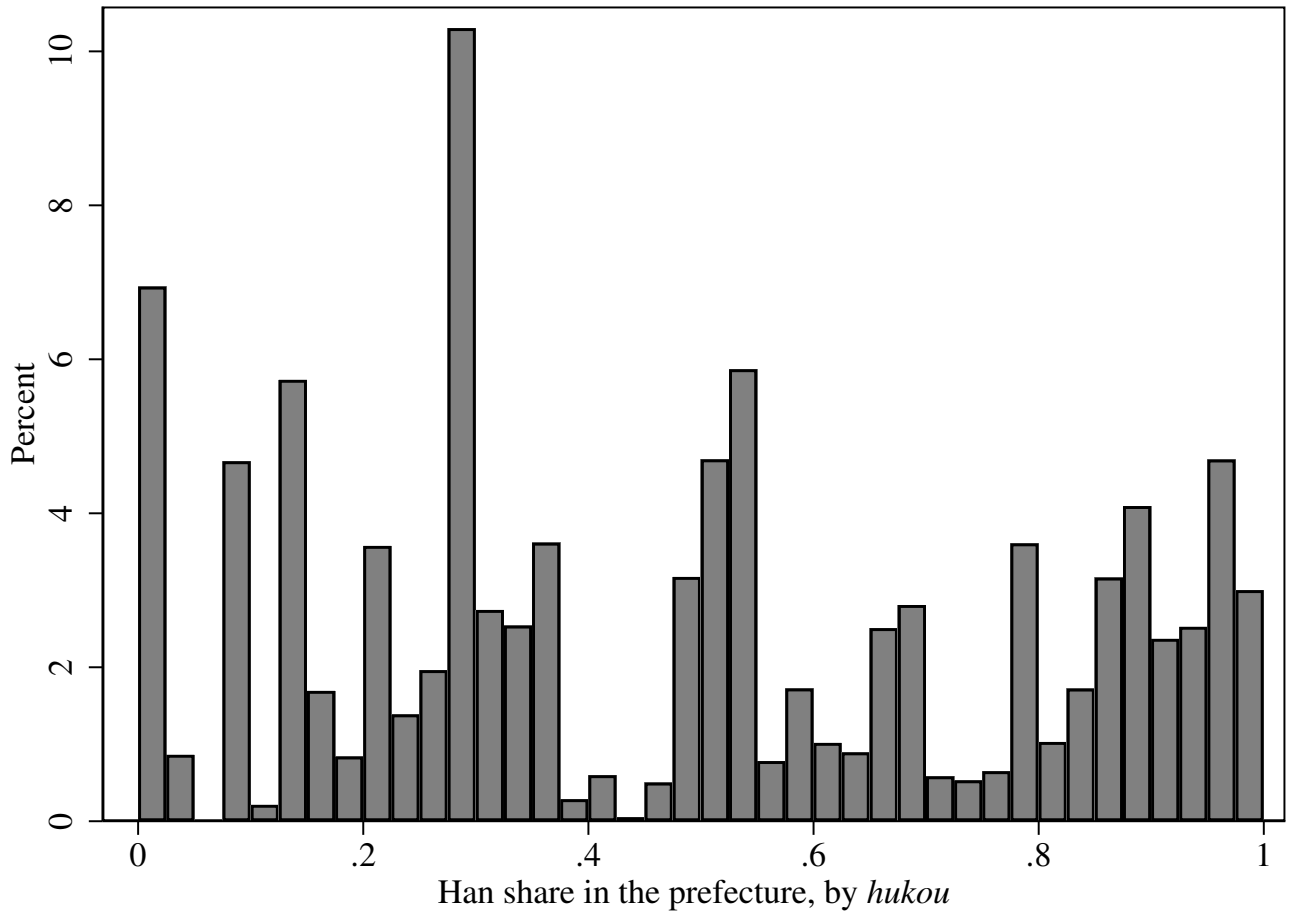
Distribution of Han share in 1990



Note: Distribution of Han share in the reference group for minority women. Authors' own calculation based on the 1% sample of the census 1990.

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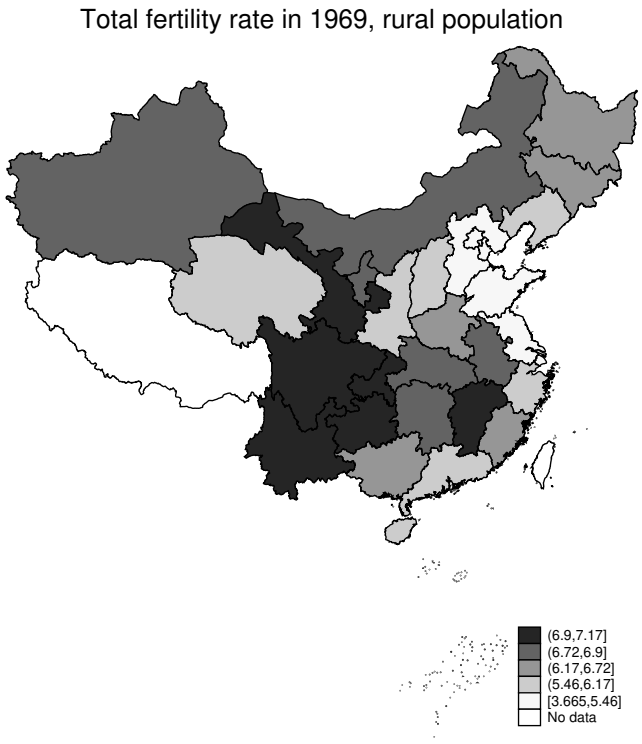
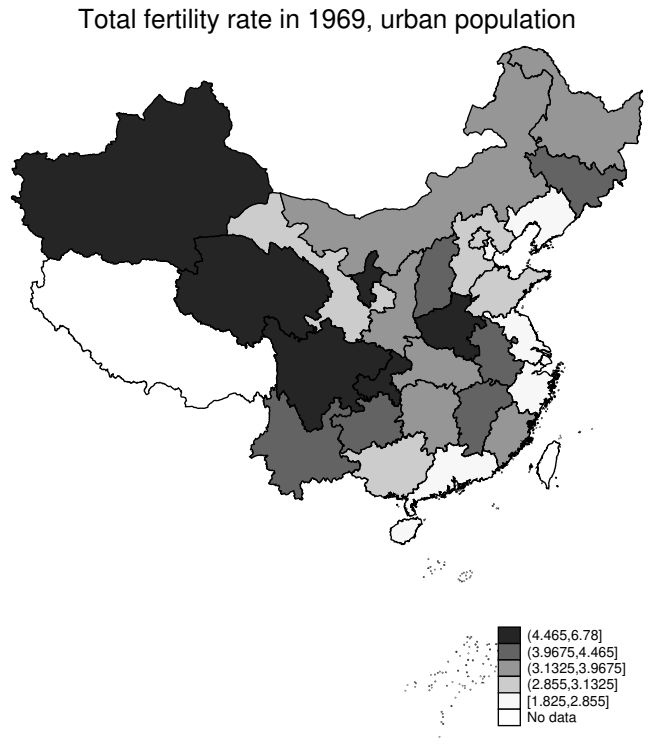
Pre-reform TFR by province, in rural and urban areas





Source: Coale and Chen (1987)

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Table 5: Alternative definitions of the reference group

Dep. var.: completed fertility of minorities Reference group:	(1) Prefect-*hukou*-3cohorts	(2) County-*hukou*-3cohorts
Group average fertility ($\bar{y}^{(-i)}$)	0.629*** (0.138)	0.736*** (0.340)
R^2	0.179	0.222
Number of clusters	5063	8074
F stat	190	25
Observations	55049	41813

Note: In columns (1) and (2), a woman's reference group is defined as all women living in the same prefecture, holding the same *hukou*, and born in the same year or 1 or 2 years before. In columns (3) and (4), a woman's reference group is defined as all women living in the same county, holding the same *hukou*, and born in the same year or 1 or 2 years before.

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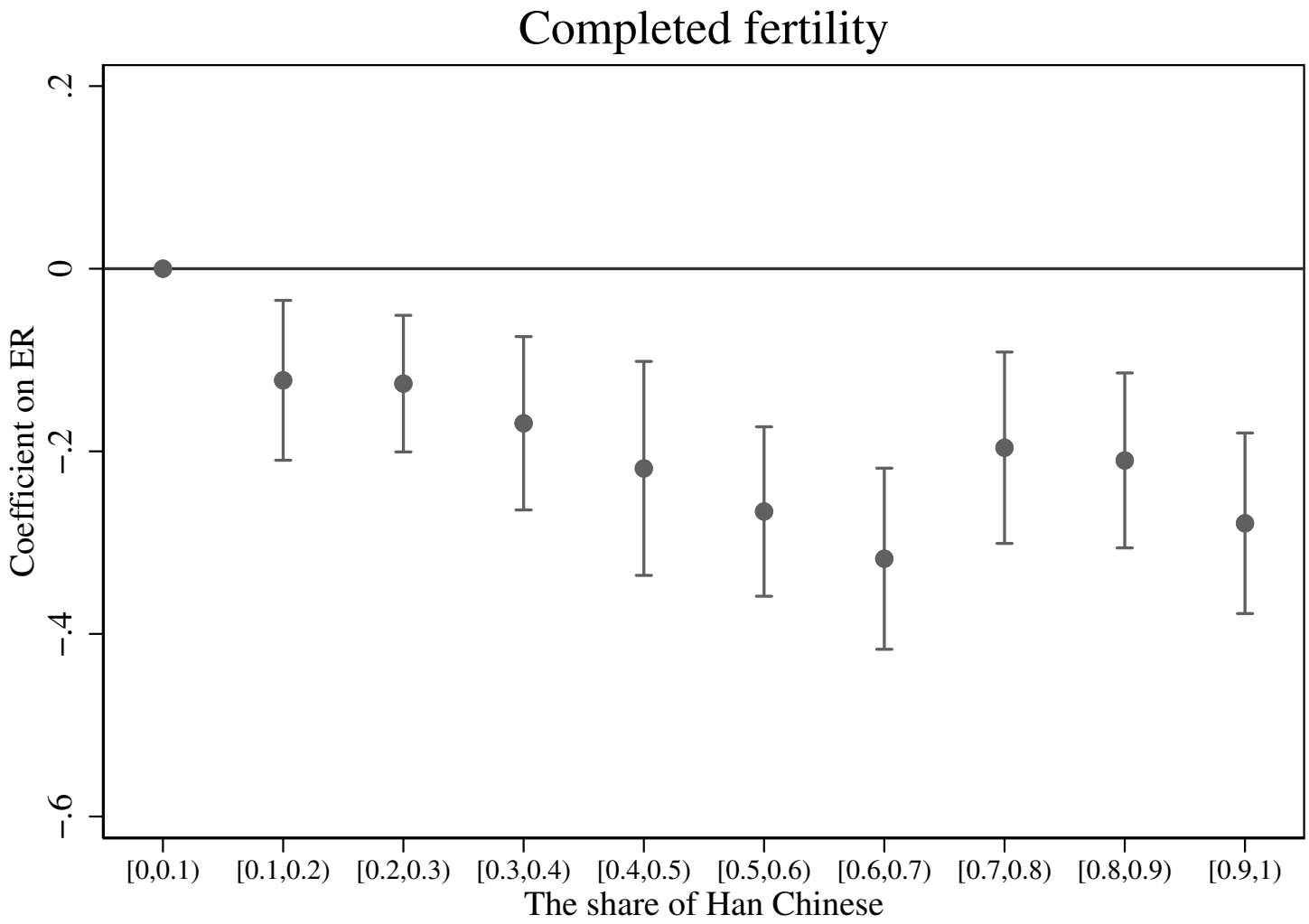
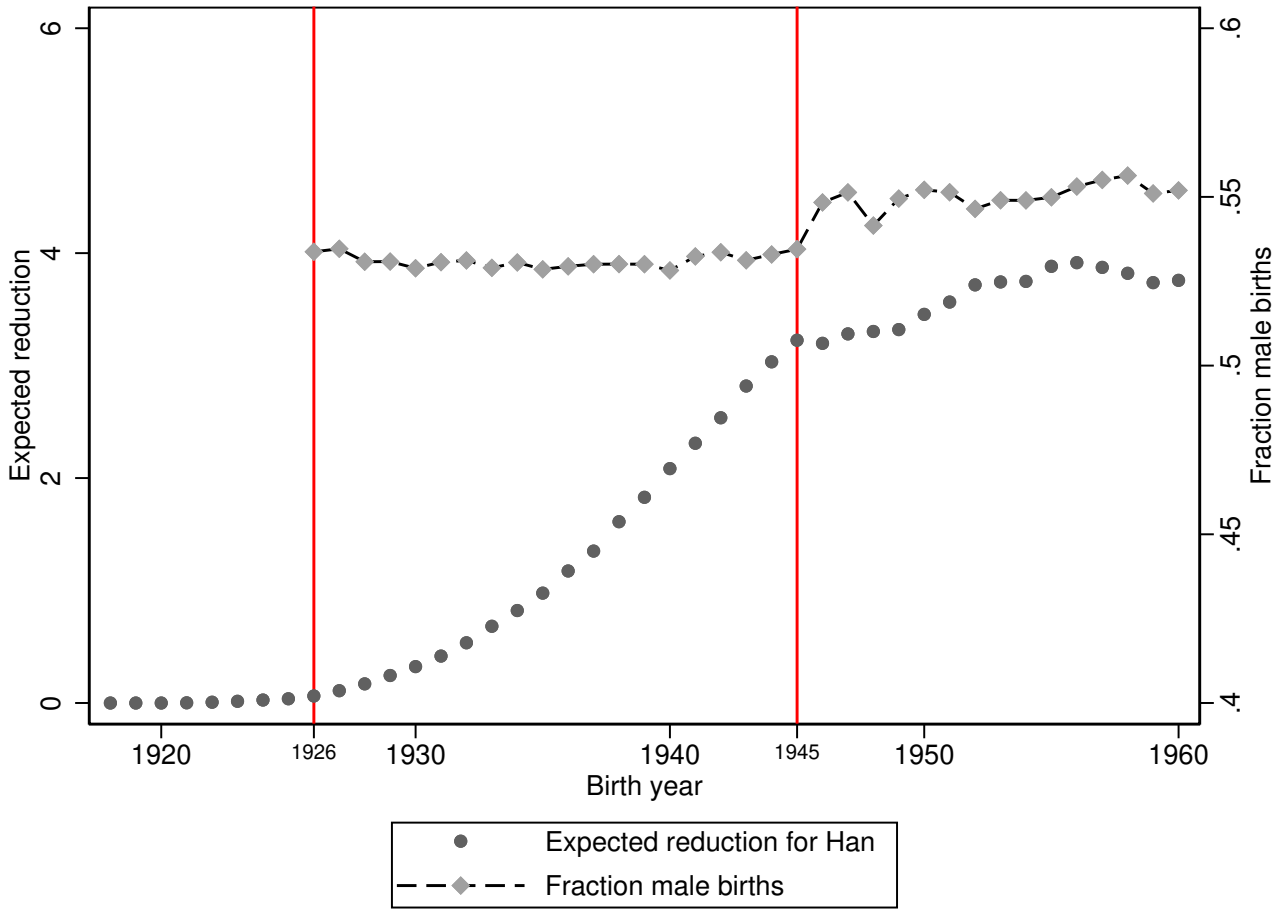
Nonlinear effects of ER



Robustness checks

Sex selection

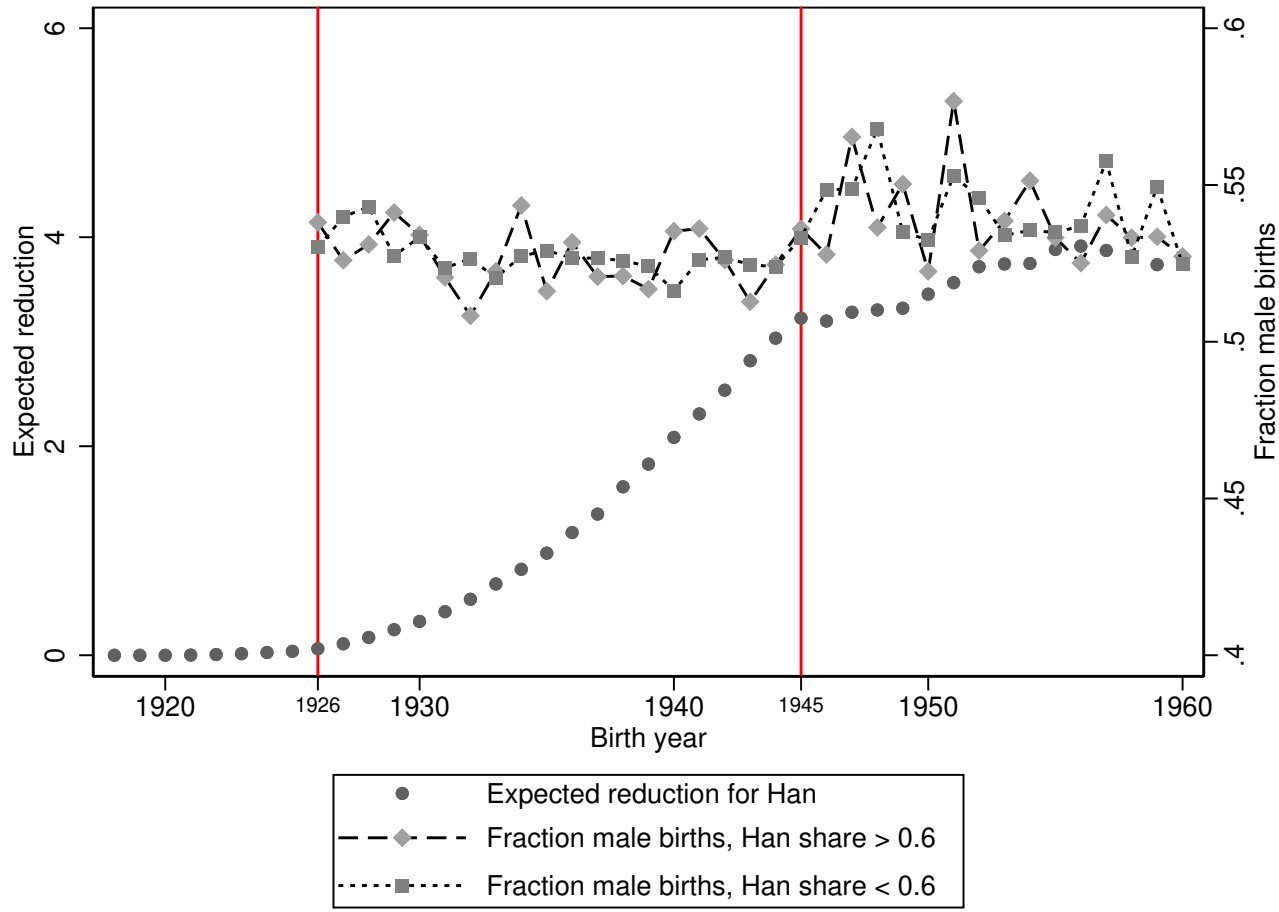
Figure 1: Sex ratio at birth and expected fertility reduction for the Han Chinese



Note: Sex ratio at birth is calculated based on the 1% sample of the 1982 and 1990 censuses and the 20% of the 2005 mini-census. Expected fertility reduction are constructed with provincial fertility data from Coale and Chen (1987).

Sex selection

Figure 2: Sex ratio at birth and expected fertility reduction for the minority Chinese



Note: Sex ratio at birth is calculated based on the 1% sample of the 1982 and 1990 censuses and the 20% of the 2005 mini-census. Expected fertility reduction are constructed with provincial fertility data from Coale and Chen (1987).

Table 6: Excluding units affected by ethnicity reclassification

	(1) Prefectures	(2) Ethnic groups
Group average fertility ($\bar{y}^{(-i)}$)	0.610***	0.500***
	(0.108)	(0.115)
R^2	0.169	0.165
Number of clusters	5077	4500
F statistics	95	89
Observations	50534	42556

- A wave of reclassification in the 1980s during which 12 million people switched from either unofficial minorities or Han to official minorities.
- (1): Prefectures excluded if the share of Han changed by more than 20% between 1982 and 1990.
- (2): Most affected groups (Manchu, Tujia, Miao, Dong, Yilao and Qiang) are excluded.

Robustness checks

Table 7: Estimation of intra- and inter-ethnicity spillovers

Dep. var.: completed fertility of minorities	(1) Heterogenous model	(2) Homogenous model
Han share × Han average fertility ($s^H \bar{y}^H$)	0.627***	
	(0.105)	
Minority share × Minority average fertility ($(1 - s^H)\bar{y}^{M(-i)}$)	0.713***	
	(0.143)	
Group average fertility ($\bar{y}^{(-i)}$)		0.617***
		(0.146)
Number of clusters	3747	3747
F statistics	22.384	66.368
Observations	53829	53829

Note: In column (1), we use the set of empirical IVs $\{s^H ER, (s^H)^2(1 - s^H)ER, (1 - s^H)s^H ER\}$ as instruments for $s^H \bar{y}^H$ and $(1 - s^H)\bar{y}^{M(-i)}$ to recover an estimate of the inter-ethnicity parameter θ^b (coefficient on $s^H \bar{y}^H$) and an estimate of the intra-ethnicity parameter θ^w (coefficient on $(1 - s^H)\bar{y}^{M(-i)}$).

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Table 8: Parallel pre-trends: placebo test using older cohorts

	(1)	(2)
	Completed fertility of minorities	
Placebo exposure	0.178	0.163
	(0.420)	(0.454)
Han share × Placebo exposure		0.022
		(0.111)
R^2	0.119	0.119
Number of clusters	595	3122
Mean dep var	5.740	5.740
Observations	20370	20370

Robustness checks

Robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep. var.: completed fertility of minorities							
	Estimations with and without linear trends						Alternative measures	
Sample:	All provinces		Low Han provinces		High Han provinces		All	
Han share × Exposure ($s^H \times ER$)	-0.208***	-0.422***	-0.206***	-0.222***	-0.173**	-0.179**		
	(0.043)	(0.035)	(0.053)	(0.052)	(0.077)	(0.072)		
Han share × ER^{nat}							-0.255***	
							(0.051)	
$\mathbb{1}\{\text{Han share} \geq 0.47\} \times \mathbb{1}\{\text{ER} \geq 2\}$								-0.281***
								(0.050)
Province-*hukou* linear trend	Yes	No	Yes	No	Yes	No	Yes	Yes
R^2	0.173	0.168	0.105	0.104	0.260	0.255	0.173	0.173
Number of clusters	5514	5514	1392	1392	4122	4122	5514	5514
Mean dep var	5.075	5.075	5.340	5.340	4.704	4.704	5.075	5.075
Observations	58887	58887	34374	34374	24513	24513	58887	58887

Note: Low/High Han provinces: Han share below/above 70%. In col (7), the share of negative weights is equal to 11% and the sum of negative weights is equal to -0.016 (de Chaisemartin and D'Haultfoeuille, 2019).

Robustness checks

Potentially heterogenous direct effect

Robustness checks

Dep. var.: completed fertility of minorities	(1) Direct effect	(2) Heterogenous direct effect	(3)	(4)
Panel A: Reduced-form				
ER	-0.022	-0.021	-0.042	-0.381*
	(0.157)	(0.217)	(0.218)	(0.230)
$s^H_{rd} \times$ ER	-0.208***	-0.208***	-0.212***	-0.134***
	(0.043)	(0.044)	(0.044)	(0.044)
$s^H_{rpc} \times$ ER		-0.001	-0.080	-0.094
		(0.191)	(0.193)	(0.189)
Urban *hukou* × ER			0.679***	0.829***
			(0.192)	(0.206)
Illiterate × ER			-0.012	-0.030
			(0.019)	(0.019)
High school × ER			0.043	0.050
			(0.051)	(0.052)
Share urban *hukou* × ER				-0.150**
				(0.066)
Share illiterate × ER				0.549***
				(0.134)
Share high school × ER				0.364
				(0.601)
Panel B: IV, instrument $s^H_{rd} \times ER$				
Group average fertility	0.629***	0.628***	0.644***	0.500***
	(0.104)	(0.106)	(0.105)	(0.140)
ER	-0.016	-0.014	-0.025	-0.236
	(0.109)	(0.139)	(0.138)	(0.168)
R^2	0.167	0.167	0.166	0.170
Mean dep var	5.075	5.075	5.075	5.075
Number of clusters	5514	5514	5514	5514
F statistics	99.691	94.054	94.819	70.856
Observations	58887	58887	58887	58887

Quality-Quantity trade-off

Mechanisms

Table 9: Effects of family planning policies on education

Dep. var.:	(1) # siblings	(2)	(3) Attend senior HS	(4)
Panel A. Han Chinese children				
Mother's Exposure (ER)	-0.168***	0.015***	0.008	
	(0.044)	(0.006)	(0.005)	
Father's occupation education-intensive			0.008***	
× Mother's Exposure			(0.002)	
R^2	0.371	0.295	0.301	
Number of clusters	1120	1120	1120	
Mean dep var	4.053	0.143	0.143	
Observations	824858	824858	824858	
Panel B. Minority Chinese children				
Han share × Mother's exposure ($s^H \times$ ER)	-0.236***	-0.002	-0.004	-0.002
	(0.051)	(0.004)	(0.004)	(0.004)
Strong labor market competition with Han			0.011**	0.012**
× Han share × Mother's Exposure			(0.006)	(0.006)
Strong cultural integration with Han				-0.004
× Han share × Mother's Exposure				(0.004)
R^2	0.303	0.295	0.295	0.295
Number of clusters	4393	4393	4393	4393
Mean dep var	4.835	0.092	0.092	0.092
Observations	67665	67665	67665	67665

- Children aged 16-25 who are registered in the same household as their parents