Appendix

Pricing Children, Curbing Daughters:
Fertility and the Sex Ratio During China's One-Child Policy

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Evaluation Form for Local Birth-Planning Officials. Table A.1 presents an example of the forms used to evaluate birth-planning officials' performances by the village and town governments. The performances depended on local aggregate fertility and citizens' knowledge of the policy.

Table A.1. Evaluation Form Used to Evaluate Birth-Planning Officials, 1992

	Maximum credit points		
A. Birth-planning targets	35		
1. Target formulation		12	
according to upper-level mandate, by scientific reasoning			12
self-decreed, without sufficient basis			6
transmitted by upper level			4
no targets existing,			0
2. Target fulfillment		23	
fulfilled, birth rate < 15%			23
not fulfilled, birth rate 15-16%			16
not fulfilled, birth rate 16-18%			10
not fulfilled, birth rate > 18%			4
B. Birth-planning work	35		
1. Propaganda work		12	
> 80% of couples of reproductive age grasp present birth policy			12
70-80% of couples of reproductive age grasp present birth policy			9
60-70% of couples of reproductive age grasp present birth policy			6
< 60% of couples of reproductive age grasp present birth policy			3
2. Technical services		12	
contraceptive prevalence (married women of reproductive age) > 80%			12
contraceptive prevalence (married women of reproductive age) 70-80%			9
contraceptive prevalence (married women of reproductive age) 60-70%			6
contraceptive prevalence (married women of reproductive age) < 60%			3
3. Policy implementation		11	
penalty rate for above-quota births > 95%			11
penalty rate for above-quota births 80-95%			8
penalty rate for above-quota births 65-80%			5
penalty rate for above-quota births < 65%			2
C. Economic benefits of birth planning	15		
good economic benefits			15
satisfactory economic benefits			10
medium economic benefits			6
poor economic benefits			2
D. Social benefits of birth planning and image of birth-planning personnel	15		
> 90% of canvassed population have good opinion of birth-planning dept.			15
80-90% of canvassed population have good opinion of birth-planning dept.			10
70-80% of canvassed population have good opinion of birth-planning dept.			6
< 70% of canvassed population have good opinion of birth-planning dept.			2
Head of evaluation team (signature)		Total credit points:	

Note: This table reproduces an evaluation form used to evaluate birth-planning officials in towns and villages. **Source:** Adapted from Li Jinfeng (1992).

Criteria for Additional-Child Permits. Table A.2 lists the different criteria needed to obtain an exemption for paying a policy price to have second or third children. It contains the same information as Table 1 in the main paper, but enumerates the criteria as in Scharping (2003). There was province and time variation in the criteria. Tables A.3, A.4, A.5, and A.6 document this variation. Table A.7 describes the empirical construction of the criteria in Table A.2.

The longitudinal construction for criteria 1 to 3 and 16 and 17 is straightforward because number of children and sex of each child, as well as years of birth, are provided. Criteria 5 and 14 are time-invariant, so the corresponding longitudinal construction is straightforward as well. Note that assignment of parent as martyr happens before the policy. For criteria 6, the corresponding longitudinal information is provided. For criteria 7, I use the characteristics of the main region in which the respondent lives, noting that migration was extremely limited during the time of my analysis (see Section 2). These regional characteristics are time-invariant (longitudinal construction follows). A similar rule applies for criterion 9 because individuals are assigned to a specific job and report what their lifetime specific jobs were, as explained in Section 2. For criteria 10, 11, and 13, I assume that the reported number of siblings of the woman and her spouse was the final number of siblings before they themselves began having children, making it a time-invariant characteristic (longitudinal construction follows). For criterion 13, the survey asks individuals to describe their main, lifetime household arrangement. For criterion 15, I classify a household as being socio-economically disadvantaged if the village or town where it is located is below the within-sample, year-specific 1st percentile of average household income.

Table A.2. Criteria Setting the Policy Price of Having Having Second or Third Children to Zero

1. First child is disabled or dead	2. Pregnancy after long years of childless marriage and a subsequent adoption	3. In remarriage one spouse has been childless, the other spouse already had one or two children
4. One or both spouses returned to China from Hong Kong or Taiwan	5. One or both spouses belong to a national minority with less than 10 million members	6. **One spouse is disabled and cannot work**
7. **A peasant couple lives in sparsely settled mountain, reclamation, or border seas**	*8. One spouse is a deep-sea fisherman*	9. **One spouse has been constantly working in underground mining for more than 5 years**
10. *One spouse or both spouses are single children*	11. *Only one child or one son has been born to a family for two generations*	*12. Among brothers, only one is able to produce children*
13. *Husband settles in the family of his wife which has daughters and no sons*	14. One spouse is the (single) child of a revolutionary martyr	15. **Couple has real economic difficulties or claims other peculiar reasons**
16. First child is a girl (and couple has economic difficulties)	17. Three, four, or five years after birth of first child	

Note: This table lists the criteria setting to the policy price for having a second or third child to zero. The applicability of these criteria varies by province and time as indicated in Tables A.3, A.4, A.5, and A.6. In the sample analyzed in the paper, I can observe whether women comply to each criterion except for the three cases in *italics* (I do not observe the individual characteristics required to observe compliance based on these three criteria). Appendix Table A.7 describes the empirical construction of compliance to the criteria. In the paper, I classify the criteria in gray as "first child dead, disabled, or older," the criteria in **bold** as "job difficulty," and the starred criteria (*) as "male scarcity in the family." The criteria in black (no italics) are classifications of their own. **Source:** Adapted from Scharping (2003).

Table A.3. Applicability of Criteria Setting to Zero the Policy Price for Having Second or Third Children 1979-2000, 1/4

Province	Years	Agricultural and Non-Agricultural Women	Additional Criteria for Agricultural Women
Beijing	1979–1981	none	none
	1982–1990	1,2,3,4,5	7,10,12,13
	1991–2000	1,2,3,4,5,15	6,(7),12,13,(16)
Tianjin	1979–1981	none	none
	1982–1987	none	1,2,3,6,10,12,15
	1988–1992	1,2,3,4,(5),10	6,12,13,(16)
	1993–1996	none	none
	1997–2000	1,2,3,4,(5),10	6,12,13,(16)
Hebei	1979–1981	none	none
	1982–1985	1,2,3	5,7,8,10,12,13
	1986–1988	1,2,3,9	5,7,8,10,12,13
	1989–2000	1,2,3,4,5,6,9,10,15	(7),8,13,(16)
Shanxi	1979–1981	none	none
	1982–1985	1,2,3,4,5	6,7,10,12,13,14
	1986–1988	1,2,3,15	10,12,13
	1989–2000	1,2,3,4,5,6	7,(12),13,(16)
Anhui	1979–1980	17	none
	1981–1983	1,2,3,5	none
	1984–1987	1,2,3,4,5,6,9,10	7,12,13
	1988–1991	1,2,3,4,5,6,9,10,12	13,16
	1992–2000	1,2,3,4,5,6,(9),10,12	13,16
Fujian	1979–1981	none	none
	1982–1987	1,2,3,5	13,15
	1988–1990	1,2,3,4,5,6,8,9,14	7,10,12,13
	1991–2000	(1),(2),(3),(4),(5),(6),(8),(9),(10),(14)	7,11,12,13
Jiangxi	1979–1982	none	none
	1983–1984	1,2,3	7,10,12,13
	1985–1989	1,2,3,4,5,9,10	7,10,12,13,16
	1990–1994	1,2,3,4,(5),(9),14,15	11,12,(13),16
	1995–1996	none	none
	1997–2000	1,2,3,4,(5),(9),14,15	11,12,(13),16
Shandong	1982–1987	1,2,3	10,12,13,14
	1988–1995	1,2,3,4,5,(6),8,(9),15	8,12,13,14,16
	1996–2000	1,2,3,4,5,(6),8,(9),10,15	8,12,13,14,16
Henan	1982–1984	1,2,3,7,12	none
	1985–1986	1,2,3,4,5,6,9,10,14,15	7,11,12,13
	1987–1989	none	(16)
	1990–2000	1,2,3,4,(9),14	5,(7),13,16

Note: This table lists the province and time variation in the criteria setting to zero the policy price for having a second or third children, listed in Table A.2. When the criterion is in parentheses, the household had to be socio-economically disadvantaged for the permit to be granted. **Source:** Adapted from Scharping (2003).

A.5

Table A.4. Applicability of Criteria Setting to Zero the Policy Price for Having Second or Third Children 1979-2000, 2/4

Province	Years	Agricultural and Non-Agricultural Women	Additional Criteria for Agricultural Women
Hubei	1979–1986	none	none
	1987–1990	1,2,4	6,10,13,6
	1991–2000	1,2,3,4	6,11,13,16
Hunan	1979–1981	(17)	none
	1982–1988	1,2,3,4	(15)
	1989–2000	1,2,3,4,5,10	11,12,13,14,(16)
Guangdong	1979	none	none
	1980	(17)	none
	1981–1985	1,8,9	3,7,16
	1986–1991	1,2,3,4,5,9,10	(16),(17)
	1992–1996	1,2,3,(4),(5),9,10	(17)
	1997	none	none
	1998–2000	1,2,3,(4),(5),9,10	16
Guangxi	1979–1981	none	none
	1982–1984	1,2,3,6	5,15
	1985–1987	1,5,6,9,10	7,13,16
	1988–2000	1,2,35,6,19,14	7,12,13,16
Hainan	1979–1983	none	none
	1984	1,2,3,9,10	7,8,16
	1985–1988	1,2,3,9,19	16
	1989–1994	1,2,3,4,5,(6),(9),(14)	15
	1995–2000	1,2,3,4,5,15	none
Chongqing	1979–1996	none	none
	1997–2000	1,2,3,4,10	6,7,11,12,13,14,(16)
Sichuan	1979–1981	none	none
	1982–1983	1,2,3,4,15	15
	1984–1986	none	6,7,12,13,14,(16)
	1987–1992	1,2,3,4,10	6,7,12,13,14,(16)
	1993	none	none
	1997–2000	1,2,3,4	6,7,12,13,(16)
Guizhou	1979–1981	17	none
	1982–1983	1,2,3	5,15
	1984–1986	1,2,3,5,6,10	11,12,13,15
	1987–1997	1,2,3,4,5,10	13,15
	1998–2000	1,2,3,4,10	13
Yunnan	1979–1985	none	none
	1986–1989	1,2,3,4,5,(6),10,13	5,7,17
	1990–2000	1,2,3,4,(6),10	(5),(7),15

Note: Continuation of Table A.3. **Source:** Adapted from Scharping (2003).

A.6

Table A.5. Applicability of Criteria Setting to Zero the Policy Price for Having Second or Third Children 1979-2000, 3/4

Province	Years	Agricultural and Non-Agricultural Women	Additional Criteria for Agricultural Women
Inner Mongolia	1979–1981	none	none
	1982–1984	1,2,3,5	15
	1985–1987	1,2,3,4,5,9,10,15	6,7,12,13,16
	1988–1989	1,2,3,4,5,9	6,7,12,13,16
	1990–2000	1,2,3,5,9,15	6,16
Liaoning	1979	17	none
	1980–1981	1,3	none
	1982–1983	1,3	5
	1984	1,2,3,10	5,8,12,13
	1985–1986	1,2,3,19	5,8,12,13,(16)
	1988–2000	1,2,3,(5),19,15	5,8,12,13,16
Jilin	1988–1992	1,2,3,4,5,10,15	6,11,12,16
	1993–1996	1,2,3,4,5,10	(6),12,16
	1997–2000	1,2,3,4,5,10,15	(6),12,16
Heilongjiang	1979	1,17	none
	1983–1988	1,2,3,5	10,12,13
	1989–1993	1,2,3,4,5,6,10	12,13,16
	1994–1998	1,2,3,4,5,15	7,10,12,16
	1999–2000	1,2,3,4,5,10,15	7,16
Shanghai	1979–1980	none	none
	1981	1,2,3	none
	1982	none	none
	1984	1,2	3,6,10,12,13
	1987	1,2,3,4,9	5,6,8,10,12,13,14
	1992	1,2,3,4,(5),10,15	6,(8),(13)
Jiangsu	1979–1981	1,17	none
	1982–1984	1,2,3	10,12
	1985–1989	1,2,3,4,8,10,14,15	7,12,13
	1990–1994	1,2,3,4,(8),(9),10,11,14,15	7,12,13,(16)
	1995–2000	1,2,3,4,(9),10,11,14,15	7,(8),12,13,(16)
Zhejiang	1979–1981	none	none
	1982–1984	1,2,3,5	(15)
	1985–1988	1,2,3,4,5,9,10,14,15	6,(7),(8),12,13,(15)
	1989–2000	1,2,3,4,5,(9),10,14,15	(7),(8),11,13,(16)

Note: Continuation of Table A.3. **Source:** Adapted from Scharping (2003).

Table A.6. Applicability of Criteria Setting to Zero the Policy Price for Having Second or Third Children 1979-2000, 4/4

Province	Years	Agricultural and Non-Agricultural Women	Additional Criteria for Agricultural Women
Shaanxi	1979–1980	17	none
	1981	1,2,3,5,7	none
	1982–1984	1,2,3,4,5	7
	1985	1,2,3,4,5,6	7,11,12,13
	1986–1987	1,2,3,4,5,10,15	6,7,12,13
	1988–1990	15	(7),(16)
	1991–2000	1,2,3,4,5,10	6,7,13,16
Gansu	1979–1981	none	none
	1982–1984	1,2,3	15
	1985–1988	1,2,3	15,16
	1989–1996	1,2,3	5,13, (7 and 16)
	1997–2000	1,2,3,4	5,13,14,15,16
Qinghai	1979–1981	none	none
	1982–1984	3,15	none
	1985	3,4,6,10	none
	1986–2000	1,2,3,4,5,6,10	none
Ningxia	1979	none	none
	1980–1981	17	none
	1982	1,2,3	17
	1986	1,2,3,4,5,6,10,15	17
	1990	1,2,3,4,5,9,10	17
Xinjiang	1979–1980	none	none
	1981–1987	5	none
	1988–1990	5	none
	1991–2000	1,3,4,5,6,9,10	(17)

Note: Continuation of Table A.3. **Source:** Adapted from Scharping (2003).

**Table A.7.** Empirical Construction of the Criteria in Table A.2

	Wave and Relevant Data File	Construction Summary
1	Wave 2013, Child	Year of birth of all children provided; possible to indicate whether or not first child died
2	Wave 2013, Child	Year of birth and biological origin of children provided
3	Wave 2013, Child	Number and year of birth of non-biological children available
4	N/A	Previous residence in Hong Kong or Taiwan not available
5	Wave 2014, Demographic	Data on ethnicity available
6	Wave 2011, Work, Retirement, Pension	Data on year(s) and reason(s) for unemployment available (e.g., disability)
7	Wave 2011, Village/town	Type of landscape provided; classify as sparse if population density $<$ within-sample 5$^{\text{th}}$ percentile
8	N/A	Unable to classify as deep-sea fisherman
9	Wave 2011, Village/town	Main job individuals seek available; mining available$^{\text{th}}$ percentile
10	Wave 2011, Family	Number of respondent's and spouse's siblings available
11	Wave 2011, Family	Number of respondent's and spouse's siblings available
12	N/A	Detailed information on brothers' fertility is not available
13	Wave 2011, Family	Number and sex of respondent's and spouse's siblings available
14	Wave 2014, Wealth History	Information of martyr status of parent available
15	Wave 2011, Village/town	Classify as being in economic disadvantage if village/town of residence $<$ within-sample 1$^{\text{st}}$ percentile of the average household income
16	Wave 2011, Child	Sex of all children provided; economic disadvantage as in 15
17	Wave 2011, Child	Year of birth of all children provided; use three year spacing

Note: This table describes the empirical procedure for assigning women as compliant with the criteria in Table 1 based on the questions in the China Health and Retirement Longitudinal Survey (National School of Development, 2017). When the conditions in Tables A.3 to A.6 are in parentheses, the authorities additionally required for households to be at a socio-economic disadvantage. I classify a household as at a socio-economic disadvantage if the village or town where it is located is below the within-sample 1$^{\text{st}}$ percentile of average household income. The relevant data files (e.g., Child, Work, Retirement) are labeled as specified by the China Health and Retirement Longitudinal Survey. **Source:** Author's creation.

Proportional and Lump-Sum Permit Price Provinces. I list the provinces that taxed the policy price as a lump sum during the years indicated using information from Scharping (2003). Provinces or periods not listed taxed the policy price as proportional to household labor income. Beijing (1993-2000), Hebei (1990-2000), Inner Mongolia (1996-2000), Liaoning (1993-2000), Shanghai (1993-2000), Jiangsu (1991-2000), Fujian (1992-2000), Jiangxi (1979-2000), Shandong (1979-2000), Guangdong (1993-2000), and Guangxi (1979-2000).

Sample Validation. I validate the nationally representative sample that I construct by showing that it closely replicates the time series of the total fertility rate reported in The World Bank (2017a). Figure A.1 displays this exercise.

Figure A.1
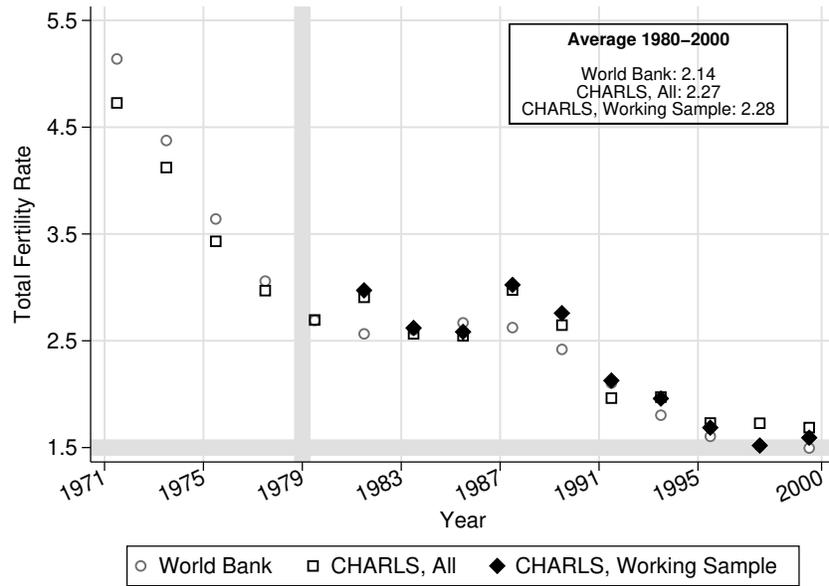
Note: This figure displays time series for the total fertility rate in China from The World Bank (2017a) for the years 1971 to 2010 and from the nationally representative panel of women who were 15 to 45 years old between 1979 and 2000 that I construct for this paper. I group years in two-year bins for clarity.

Female Labor Supply and Migration. Figure A.2 describes labor force participation for the nationally representative panel of women who were 15 to 45 years old between 1979 and 2000 that I construct in this paper, as well as the fraction of household heads who moved or relocated at the village and town level.

Figure A.2. Economic Decisions in an Inflexible Setting

(a) Female Labor Supply, Individual Level

(b) Household Heads' Migration
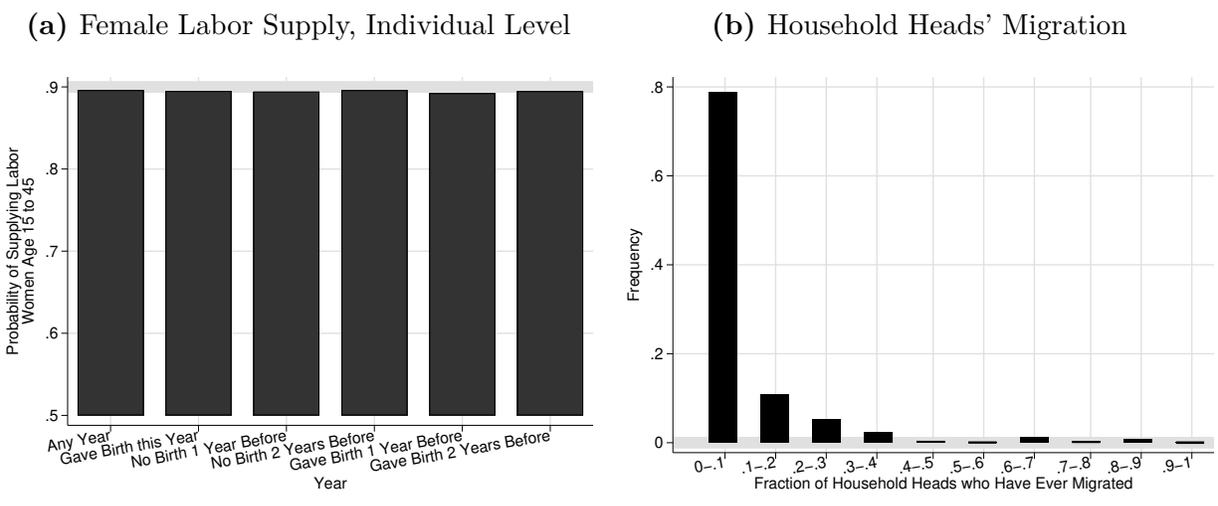
Note: Panel (a) displays the empirical probability of women being in the labor force participation in any given year, the year of giving birth, and one and two years before and after giving birth. Panel (b) displays the frequency of the fraction of household heads who ever moved or relocated at the village and town level. **Sample:** Nationally representative panel of women who were 15 to 45 years old between 1979 and 2000.

Aggregate Statistics. Figure A.3 presents time series for basic economic variables in China during the period that I analyze, as well as the sex ratio at birth by cohort of the women in the sample that I analyze.

Figure A.3. Population, GDP *per Capita,* and Sex Ratio at Birth

(a) Population

(b) Population Growth

(c) GDP *per Capita*

(d) Sex Ratio at Birth Balance
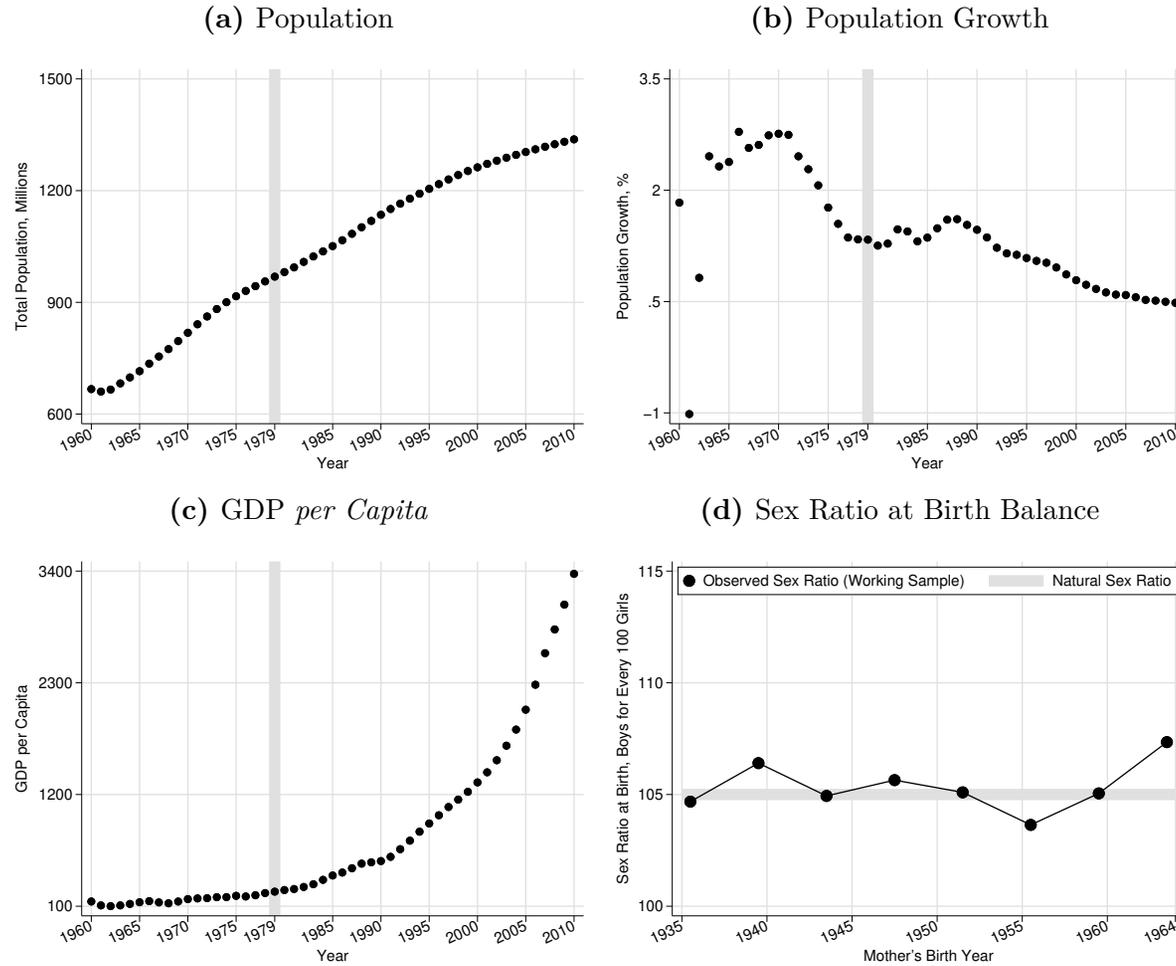
Note: Panel (a) displays a time series of the population in China in millions from The World Bank (2017d). Panel (b) displays a time series of the population growth in China from The World Bank (2017c). Panel (c) displays a time series of the GDP *per capita* of China from The World Bank (2017b). Panel (d) displays the average sex ratio at birth by cohort of the women in the sample that I describe in Section 2.

Accounting for the Economic Environment. Table A.8 lists the full set of measures that I use to construct category-specific (dedicated) principal-component factors to account for the economic environment.

Table A.8. Controls Approximating the Economic Environment

Category (Factor)	Measures
Population	Total men, total women, total population, birth rate, death rate, first and second wave of migration permits
Agriculture	Grain crops (kg/hectare), cotton, oil-bearing, agricultural output, agricultural farming output, agricultural forestry output, agricultural husbandry output, agricultural fishery output, agricultural machinery, sown area, grain crops (value), grain tons, fruit tons, large animal heads, aquatic product tons
Infrastructure	Railways, highways, total passengers, railway passengers, highway passengers, freight traffic, freight traffic in railways, freight traffic in highways, civil motor vehicles, post and telecomm value, number of mailed letters
Industry	Industrial enterprises, industrial state enterprises, industrial collectives, industrial output value industrial collective output value, cloth industry, paper industry, cigarette industry, electricity industry, steel industry, steel product industry, cement industry, fertilizer industry
Employment	Employed, employed in urban areas, government staff, state enterprises workers, urban collective workers
Trade	Retail sales, exports net of imports, exports, investment in fixed assets
Government Banking	Local revenue, local revenue through taxes, local expenditure
Economic Organization	Agricultural organization (household or collective), households allowed to rent land for farming and non-farming activities, communal government
Subsidies	Unemployment subsidies, minimum allowance, farming subsidies, reforestation subsidies, pension if age 60 or older or age 80 or older, reformed or non-reformed rural pension scheme
Education	Higher education institutions, elementary schools, higher education institution teachers, middle school teachers, elementary school teachers
Economy	GDP, industry, primary industry, secondary industry, construction, tertiary industry, transportation, GDP per capita, yearly female and male labor income

Note: This table lists the categories or factors that I use to describe the economic environment, using the measures listed for each category. I obtain these measures from China Data Center (2017) and National School of Development (2017). **Source:** Author's creation.

Specification of the Main Estimation Regression in Levels. I estimate a model similar to that in Equation (5) in the main text, using the price in levels instead of the price in logs. The model is

$$\Delta n_{ia} = \text{constant} + \tilde{\gamma}_\Xi \cdot \Xi_{ia-1} + \tilde{\gamma}_{n-1} \cdot n_{ia-1} + \tilde{\varepsilon}_{ia}, \tag{A.1}$$

where Δn_{ia} indicates if woman i has a child when she is a years old and n_{ia-1} is her stock of children when she is $a-1$ years old. Ξ_{ia-1} is the policy price, $\tilde{\varepsilon}_{ia}$ is an error term, and $\tilde{\gamma}_\Xi$ and $\tilde{\gamma}_{n-1}$ are coefficients.

In the main text, I estimate a policy semi-elasticity, γ_Ξ in Equation (5). I argue that γ_Ξ is the change in the probability of having a child by γ_Ξ percentage points. To draw a simple comparison, assume for a moment that mean independence holds and that $\tilde{\gamma}_{n-1} = 0$. $\tilde{\gamma}_\Xi$ in Equation (A.1) is the change in probability of having a child when the price increases by a unit. As I explain in the main text, when mean independence does not hold and $\tilde{\gamma}_{n-1} \neq 0$, solutions to endogenity can be worked out.

To compare the magnitudes between estimates using price in logs and in levels, I use OLS. The OLS estimates of Equation (5) yield $\hat{\gamma}_\Xi = -0.031$. That is, the probability of having a child decreases by 0.031 percentage points upon a 1% increase in the policy price. The OLS estimates of Equation (A.1) yield $\hat{\tilde{\gamma}}_\Xi = -0.019$. That is, the probability of having a child decreases by 0.019 upon a one-unit increase in the policy price. The median of the policy price is 1.04. A one-unit increase in the policy price from the median is equivalent to a 96.3% increase. The estimate $\hat{\tilde{\gamma}}_\Xi$ indicates that a 1% increase in the price decreases the probability of having a child by $(0.019/96.3) \times 100 \approx 0.020$ percentage points. The semi-elasticities obtained from the two procedures, that based on Equation (5) and that based on Equation (A.1), are relatively close: 0.031 and 0.020, respectively.

Additional Details on Policy-Price Spike Events.

Figure A.4. Average Residual Flow of Children Before and After Policy Price Spikes, Defined Using Different Percentiles

(a) Based on Documentation Prices   **(b)** Based on Survey Prices
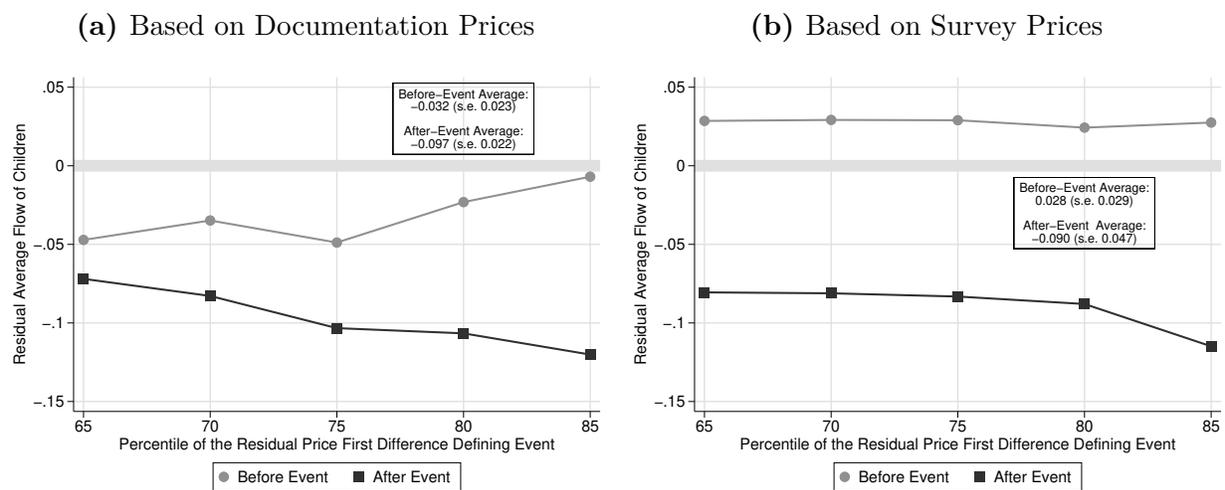
Panel (a): The scatter point at 80 labeled as "before event" is the average before the event presented in the box of Figure 5 in the main text, when using the policy prices based on documentation (see Section 2 for details on the prices). The scatter point at 80 labeled as "after event" is the counterpart average after the event presented in that same box. The points at 65, 70, 75, and 85 are analogous in format for the case when the price spikes are defined using the 65th, 70th, 75th, and 85th percentiles, as opposed to the 80th percentile as in the main text. **Panel (b)** is analogous in format to Panel (a) using the policy prices based on surveys. **Sample:** Nationally representative panel of women who were 15 to 45 years old during the year in the label.

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