

# Internet Use and Fertility Intention in China

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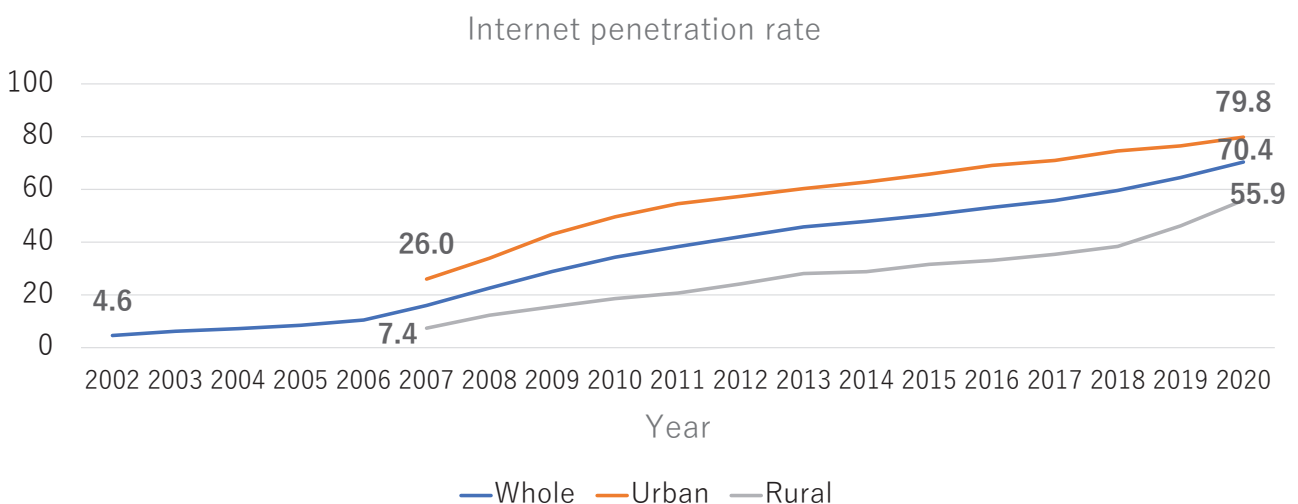
## 1. Introduction (low fertility issue)

- China's fertility at a low level (below-replacement-fertility)
- Growing old before getting rich (未富先老)
- Total fertility rate (TFR): 6.385 (1965)  $\Rightarrow$  2.309 (1990)  $\Rightarrow$  1.665 (2015)
- According to the latest data from the Seventh National Census, TFR reached 1.3 in 2020, at a low level. China has already fallen into the low fertility trap (Yan et al., 2021).

# 1. Introduction (fertility intention)

- Fertility intention and fertility behavior
- As a preliminary step to increasing the number of births and birth rate, it is necessary to create a society in which people actively want to have and raise children.
- Fertility intention as a predictor of fertility behavior (Schoen et al., 1999; Jiang et al., 2016)
- Fertility intention can be observed for men, older, and single.

# 1. Introduction (development of the Internet)



(Source) CNNIC statistical reports

# 1. Introduction (media and fertility)

- Gerbner's Cultivation theory (1969)
- Within the cultivation perspective, Signorielli (1991) points to **television's** influence as the primary source of conceptions relevant to marriage.
- 'Perceived prevalence of having fewer children in married life was significantly affected by exposure to **dramas** which positively feature single life and having fewer children in married life on television' (Jin & Jeong, 2010)
- The introduction of **cable television** lowered fertility in India (Jensen & Oster, 2009).
- Access to **television** has a significant effect in reducing fertility rates in Pakistan (Tasciotti et al., 2022).
- **Internet** is one of the promising technological changes that may solve low fertility issue improving work-life balance and increasing household income (income effect).

# 1. Contributions

- First study to examine the impact of Internet use on fertility intention using panel data
- To address endogeneity issues using IV method
- To address heterogeneity issues of different groups (gender, age, hukou, education, marital status)
- To investigate the effects of Internet use on fertility intention through the mediation effect model

## 2. Literature review

- Focusing on particular population such as urban residents (e.g., Liu & Gong, 2020), women (e.g., Zheng et al., 2016; Liu et al., 2019), women attending outpatient gynecology clinics (e.g., Lau et al., 2018), and within one province (e.g., Liu & Lummaa, 2019; Wei et al., 2018; Zheng et al., 2009)
- Fertility intention among Chinese women in the general population at the national level limited (e.g., Liu et al., 2019; Yan et al., 2021)
- The impact of Internet use on fertility decisions in developed countries (e.g., Billari et al., 2019), few related studies in the Chinese context

## 2. Literature review

Literture	Data	Results	Implication
Billari et al. (2019)	German Socio-Economic Panel (SOEP)	<ul style="list-style-type: none"> <li>• Positive effects of broadband availability on the fertility of highly educated women aged 25–45</li> <li>• No evidence of effects for women aged 17–24 and less educated women</li> </ul>	Promoting a 'digital divide' in fertility
Li et al. (2021)	CGSS 2010-2013 (pooled cross-sectional data)	<ul style="list-style-type: none"> <li>• Internet use has a significant negative impact on fertility behavior.</li> </ul>	Opportunity costs of having children (substitution effect) > increases in household income (income effect)
Wang et al. (2021)	CGSS 2017	<ul style="list-style-type: none"> <li>• The higher the frequency of the Internet usage is, the lower the fertility intention</li> <li>• Reproductive experience has a negative moderating effect.</li> </ul>	Large intergenerational "digital divide" between two generations, for individuals who use the Internet frequently, the conflict between the traditional parenting experience inherited by the parents and the parenting knowledge obtained by the children through the Internet may lead to more family conflicts → inhibiting the fertility intention

## 2. Channels of influence of Internet use on fertility intention

Positive	Negative
<p>Transition to marriage effect:</p> <ul style="list-style-type: none"> <li>✓ Reduction of search frictions to identify faster more available options and contribute to more marriages</li> </ul>	<p>Substitution effect:</p> <ul style="list-style-type: none"> <li>✓ Increase in the wage rate on childbearing through an increase in the cost of raising children.</li> </ul>
<p>Work-family balance effect:</p> <ul style="list-style-type: none"> <li>✓ Increase in labor force participation</li> <li>✓ Facilitating work-family balance (Dettling, 2017) ⇒ allowing individuals to reconcile work and parenthood more easily (Billari et al., 2019)</li> </ul>	<p>Information effect:</p> <ul style="list-style-type: none"> <li>✓ Unprecedented access to information on contraceptive behavior and the possible life-course consequences of the choice to become a parent</li> <li>✓ Cost of parenting through interactive communication ⇒ fertility panic</li> <li>✓ Changed attitudes toward gender roles (Nie et al., 2023)</li> </ul>
<p>Income effect:</p> <ul style="list-style-type: none"> <li>✓ Increase in human capital ⇒ improving productivity ⇒ higher income</li> <li>✓ Higher male wages (higher household income) ⇒ increase demand for children (Butz and Ward, 1979)</li> </ul>	<p>Marital satisfaction effect:</p> <ul style="list-style-type: none"> <li>✓ Decrease search costs and increase partnership offers outside marriage (Bellou, 2015; Billari et al., 2019)</li> <li>✓ Negative impact of IU on family cohesion and marital satisfaction (Chesley, 2005; Tong et al., 2021; Valenzuela et al., 2014)</li> <li>✓ High marital satisfaction has a positive impact on the intention to have additional children</li> </ul>
	<p>Health effect:</p> <ul style="list-style-type: none"> <li>✓ Detrimental to psychological well-being for several reasons</li> <li>✓ Time spent in online interactions &gt; in-person interactions (Tong et al., 2021)</li> </ul>

## 3. Methodology (Model)

- Fixed effects (FE) model, fixed effects ordered logit model, random effects ordered logit model, fixed-effects Poisson model

- $FI_{it} = a + \beta INT_{it} + \gamma X_{it} + v_i + u_{it}$ ,

where  $i$  denotes the individual;  $t$  denotes year;  $FI$  is the indicator of fertility intention (ideal number of children).  $INT$  is the indicator of Internet use, which is a key independent variable;  $X$  is a set of control variables;  $\beta$  and  $\gamma$  are the coefficient of variables;  $v_i$  denotes an individual-specific time-invariant factor and  $u_{it}$  denotes an idiosyncratic error.

- FE-IV model for endogeneity problem

- $INT_{it} = a + \beta_z Z_{it} + \gamma X_{it} + \mu_{it}$ ,

- $FI_{it} = a + \beta_{INT} \widehat{INT}_{it} + \gamma X_{it} + \varepsilon_{it}$ ,

- $corr(Z, \varepsilon) = 0$ , and  $corr(Z, \mu) \neq 0$ ,

### 3. Methodology (Model)

- Heterogeneity (age, gender, hukou, education, marital status)
- $INT_{it} = a + \beta_z Z_{it} + \gamma X_{it} + \mu_{it}$ ,
- $INT * Group_{it} = a + \beta_z Z_{it} + \beta_z Z * Group_{it} + \gamma X_{it} + \mu_{it}$ ,
- $FI_{it} = a + \beta_1 INT_{it} + \beta_2 Group_{it} + \beta_3 INT_{it} \times Group_{it} + \gamma X_{it} + v_i + u_{it}$ ,
- $corr(Z, \varepsilon) = 0$ , and  $corr(Z, \mu) \neq 0$ ,

### 3. Methodology (Model)

- Mediation model
- $FI_{it} = \beta_0 + \beta_1 INT_{it} + \beta_2 X_{it} + \varepsilon_i$ ,
- $Me_{it} = \beta'_0 + \beta'_1 INT_{it} + \beta'_2 X_{it} + \varepsilon'_i$ , and
- $FI_{it} = \beta''_0 + \beta''_1 INT_{it} + \beta''_2 X_{it} + \beta_3 Me_{it} + \varepsilon''_i$ ,

where  $Me$  represents mediator variables. When  $\beta'_1$  and  $\beta_3$  are statistically significant, as well as  $\beta''_1$  changes (e.g., become smaller) compared with  $\beta_1$ , we can say that Internet use affects fertility intention, possibly through mediator  $Me$ . The indirect effect is  $\beta'_1 \times \beta_3$ .

### 3. Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Fertility intention	48,035	2.063	0.844	0	12
Internet use	48,232	0.384	0.486	0	1
Internet hours	19,590	12.387	11.891	0	168
Importance of Internet as communication path	48,161	2.398	1.605	1	5
Household income	52,500	59273.840	80261.770	0	4270560
Household income per capita	52,085	20393.140	42767.950	0	3300000
Individual income	24,300	22333.530	31070.860	0	840000
Age	54,301	47.779	16.711	16	100
Gender	54,308	0.496	0.500	0	1
Urban hukou	50,735	0.255	0.436	0	1
Marital status	47,416	0.878	0.327	0	1
Health status	54,040	2.966	1.247	1	5
Education	54,221	2.221	1.348	0	8
Urban residence	51,352	0.471	0.499	0	1
Working	49,310	0.766	0.423	0	1
Public medical insurance	50,350	0.922	0.268	0	1
Public pension participation	39,058	0.630	0.483	0	1
Family size	53,821	4.289	1.992	1	21
The number of base stations of mobile phones	54,303	177639.6	125000.2	25000	559000

### 3. Methodology (Data and variables)

- The China Family Panel Studies (CFPS)
- Using CFPS2014 and CFPS2018 as only these two waves have questionnaire items on fertility intention

Variables	
Dependent var	ideal number of children as an indicator of fertility intention
Key independent var	(i) the dummy variable for Internet use (1 = “used” and 0 = “did not use”) (ii) hours of Internet use (iii) the degree of importance of the Internet for collecting information
Control var	years of schooling, age, sex (male dummy, self-reported health status (excellent, very good, good, fair, and poor), marital status, hukou, employment status, residence, number of family members, absolute income, public pension enrollment, public medical insurance enrollment, the provincial dummy, year dummy
Instrument var	the number of base stations of mobile phones in a province

# 4. Results

VARIABLES	FE		FEeogit		REeogit		FEpoisson		FE-IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Fertility intention		Fertility intention		Fertility intention		Fertility intention		Fertility intention	
Internet use	0.033**	0.034**	0.248***	0.253***	0.125***	0.152***	0.018**	0.018**	1.677***	1.697***
	(0.014)	(0.014)	(0.083)	(0.083)	(0.044)	(0.044)	(0.007)	(0.007)	(0.420)	(0.425)
Individual variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family variables	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.149***	1.135***								
	(0.230)	(0.231)								
Observations	31,651	31,651	9,244	9,244	31,651	31,651	24,690	24,690	31,651	31,651
Number of pid/panel id	19,294	19,294	3811	3811	19,294	19,294	12,345	12,345	19,294	19,294
Within R-squared	0.0150	0.0151								
Between R-squared	0.0609	0.0632							0.00623	0.00840
Overall R-squared	0.0426	0.0446							0.00196	0.00306
Log likelihood			-3065.054	-3063.326	-26483.509	-26297.405	-12505.132	-12504.987		
Pseudo R-squared			0.0433	0.0438						

Robust standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Frequency of Internet use is insignificant.

# 4. Results

VARIABLES	FE		FEeogit		REeogit		FEpoisson		FE-IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Fertility intention		Fertility intention		Fertility intention		Fertility intention		Fertility intention	
Importance of Internet as communication path										
Very important	0.038**	0.038**	0.256**	0.259***	0.170***	0.187***	0.020**	0.020**		
	(0.019)	(0.019)	(0.100)	(0.100)	(0.054)	(0.054)	(0.009)	(0.009)		
Importance of Internet as communication path									0.648***	0.651***
									(0.189)	(0.189)
Constant	1.178***	1.165***							0.029	0.010
	(0.229)	(0.230)							(0.492)	(0.494)
Observations	31,630	31,630	9,238	9,238	31,630	31,630	24,666	24,666	31,630	31,630
Number of pid	19,285	19,285			19,285	19,285	12,333	12,333	19,285	19,285
Within R-squared	0.0150	0.0151								
Between R-squared	0.0606	0.0629							0.00194	0.00165
Overall R-squared	0.0424	0.0443							0.00174	0.00151
Log likelihood			-3063.0335	-3061.5558	-26461.696	-26277.117	-12493.302	-12493.173		
Pseudo R-squared			0.0433	0.0438						

Robust standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



## 4. Results (sub-sample)

VARIABLES	age<=49		age>=50		female		male		age<=49		female		male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	FE		FE		FE		FE		FE-IV		FE-IV		FE-IV
Internet use	0.029*	0.030*	0.110***	0.109***	0.013	0.014	0.054**	0.054**	1.868***	1.895***	1.313***	1.345***	3.804***
	(0.017)	(0.017)	(0.041)	(0.041)	(0.018)	(0.018)	(0.022)	(0.022)	(0.622)	(0.630)	(0.418)	(0.428)	(1.314)
Individual variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family variables	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Observations	21,457	21,457	10,194	10,194	15,826	15,826	15,825	15,825	21,457	21,457	15,826	15,826	21,628
Number of pid	13,555	13,555	7,553	7,553	9,544	9,544	9,762	9,762	13,555	13,555	9,544	9,544	12,240
Within R-squared	0.0122	0.0139	0.0420	0.0420	0.0257	0.0261	0.0120	0.0121					
Between R-squared	0.0211	0.0303	0.00106	0.00119	0.0809	0.0836	0.0272	0.0282	0.0150	0.0128	0.0367	0.0414	0.0453
Overall R-squared	0.0166	0.0247	0.00230	0.00249	0.0569	0.0591	0.0166	0.0174	0.00950	0.00779	0.0190	0.0222	0.0330

## 4. Results (sub-sample)

VARIABLES	High school graduate or below		High school graduate above		High school graduate or below		not married		married		not married		married	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	
	FE		FE		FE-IV		FE		FE		FE-IV		FE-IV	
Internet use	0.026*	0.027*	0.040	0.029	1.752***	1.778***	0.060	0.061	0.031**	0.031**	0.605	1.730***	1.755***	
	(0.014)	(0.014)	(0.136)	(0.136)	(0.608)	(0.620)	(0.079)	(0.079)	(0.014)	(0.014)	(0.428)	(0.437)	(0.445)	
Individual variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Family variables	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	
Observations	28,891	28,891	2,771	2,771	28,891	28,891	2,937	2,937	28,714	28,714	4,695	28,714	28,714	
Number of pid	18,015	18,015	2,300	2,300	18,015	18,015	2,273	2,273	17,495	17,495	3,096	17,495	17,495	
Within R-squared	0.0130	0.0131	0.122	0.126			0.0797	0.0800	0.0166	0.0166				
Between R-squared	0.0492	0.0508	0.0100	0.0140	0.0128	0.0150	0.00648	0.00685	0.0356	0.0369	0.000586	0.00786	0.0105	
Overall R-squared	0.0346	0.0359	0.0109	0.0145	0.00601	0.00745	0.0108	0.0112	0.0233	0.0244	0.00217	0.00301	0.00451	

## 4. Results (heterogeneity)

VARIABLES	(1) FE	(2) FE-IV
Internet use	0.047*** (0.015)	1.411*** (0.386)
Internet use#urban hukou	-0.066** (0.032)	- (0.122)
Urban hukou	0.069* (0.035)	0.268*** (0.099)
Individual variables	Yes	Yes
Family variables	Yes	Yes
Province fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Constant	1.111*** (0.232)	0.579* (0.301)
Observations	31,651	31,651
Number of pid	19,294	19,294
Within R-squared	0.0155	
Between R-squared	0.0629	0.0240
Overall R-squared	0.0444	0.0122

Internet use decreases fertility intention of those who with urban hukou, addressing endogeneity issues, Internet use increases fertility intention of urban hukou residents.

## 4. Results (mediation)

VARIABLES	(1) ln(household income)	(2) fertility intention	(3)
Internet use	0.112*** (0.029)	0.034** (0.014)	0.034** (0.014)
ln(household income)			-0.008* (0.005)
Individual variables	Yes	Yes	Yes
Family variables	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Constant	10.951*** (0.435)	1.077*** (0.223)	1.135*** (0.231)
Observations	31,733	32,363	31,651
Number of pid	19,318	19,494	19,294
Within R-squared	0.0528	0.0142	0.0151
Between R-squared	0.0832	0.0636	0.0632
Overall R-squared	0.0668	0.0446	0.0446

## 5. Conclusions

- The impact of Internet use on fertility intention is statistically significant and positive.
  - Frequency of Internet use is insignificant.
  - Attitude toward the Internet measured as the degree of importance of the Internet is statistically significant and positive.
  - Positive relationship between Internet use and fertility intention among the younger generation (age under 49), married, rural hukou, and graduated from high school or below
  - The impact of Internet use on fertility intention is mediated by household income effect channel. Internet use increases household income which negatively affects fertility intention.
- ⇒ More positive information on childcare (less negative information on childcare) on the Internet

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