

Explaining the Fall in Female Labor Supply in Urban China

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August, 2021

Motivation

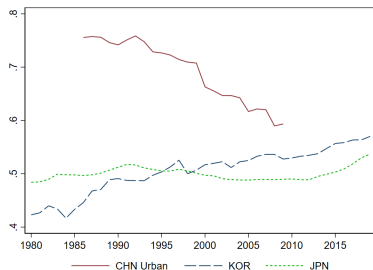
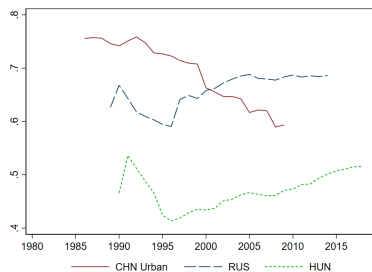
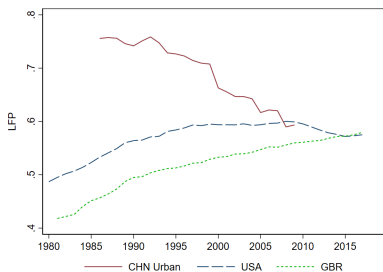


Figure: Female, age 25+. Sources: ILO.

Motivation: Why is it interesting?

- Decline of female labor force participation (FLFP) is very significant.
- Occurred when real wage is increasing substantially.
- Against many comparable countries.
- Affected groups: low educated females.

Preview of Results

- I build and estimate a structural model to study the relative importance of several factors.
- One of the very first few structural models on China's female labor supply.
- Counterfactual study shows:

Increased gender pay gap explains $\sim 70\%$ changes in FLFP.

Increased childcare cost lower 10% FLFP for low-educated women.

Increased assortative marriage increase FLFP for low-educated but decrease FLFP for medium-educated.

- Mechanism:

Faster growth in husbands' wage has a negative effect on FLFP.

Changes in family structures have multiple significant effects on FLFP.

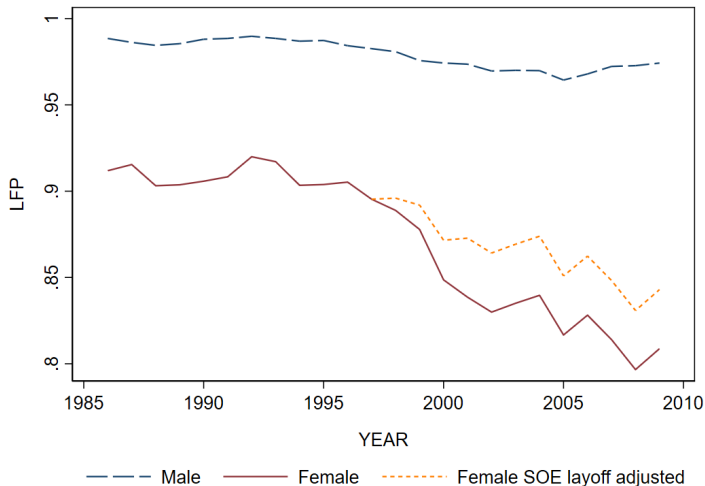
- An extensive literature on female labor supply for US and UK.
- Heckman and Macurdy (1980), Blau and Kahn (2007), Attanasio, Low, and Sánchez-Marcos (2008), Eckstein and Lifshitz (2011), Blundell et al. (2016), Chiappori, Costa Dias, and Meghir (2020).....
- Mostly on why FLFP has increased.
- Structural model frequently used.
- Important channels: market wages and family structures.

Related Literature: China

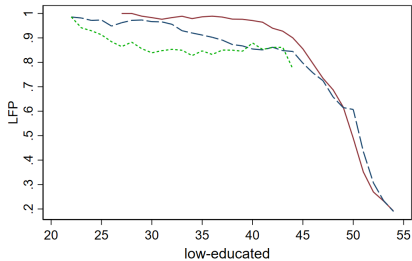
- Research is preliminary and data are more limited.
- No structural model except Gao (2020).
- Document the trend:
 - Chi and Li (2014): estimate the gender pay gap.
 - Han (2010): document the assortative marriage.
 - Feng, Hu, and Moffitt (2017): document decline of FLFP with the richest micro data.
- Most study focus on single channel:
 - Hare (2016): study the increase of female's wage on FLFP.
 - Song and Dong (2018): study childcare cost's effect on FLFP with a 2011 survey.
- This study: a structural model to study multiple interacting channels together.

- Urban Household Survey (UHS):
 - Large-scale, repeated cross-section micro data, carried by National Bureau of Statistics.
 - 1986-2009 (24 years). Covering 390,000+ families and 1.2 million individuals.
 - 2010-2014 data as a supplementary.
- Retirement age in China: 60 for men, 50-55 for women.
- Education groups:
 - Low, \leq junior high school
65% (1987) \rightarrow 45% (2010) (age 25-29)
 - Medium, \leq senior high school
33% (1987) \rightarrow 21% (2010)
 - High, \geq college
2% (1987) \rightarrow 34% (2010)

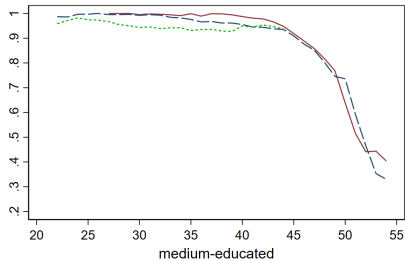
Basic Fact: FLFP is declining in urban China.



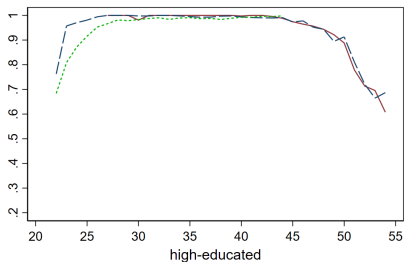
Age 25-54. marriage



— Cohort 50-59 — Cohort 60-69 ... Cohort 70-79



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— Cohort 50-59 — Cohort 60-69 ... Cohort 70-79

Interacting Channel 1: Significant increases in real wages...

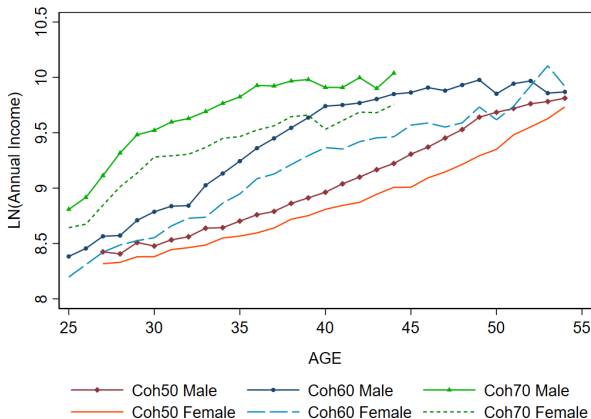
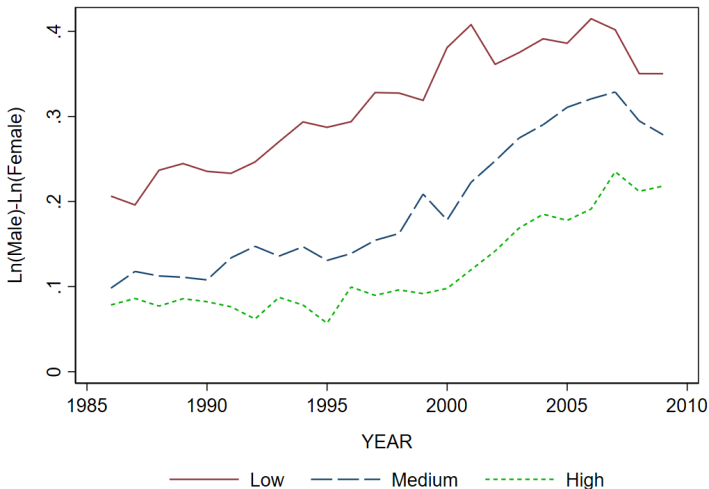


Figure: Real income (in 2009 price) of low-educated people.

Interacting Channel 1: ... the gender wage gap is widening.

- A very atypical trend.
- Well-documented (Chi and Li 2008; Chi and Li 2014).



Interacting Channel 2: Higher childcare costs...

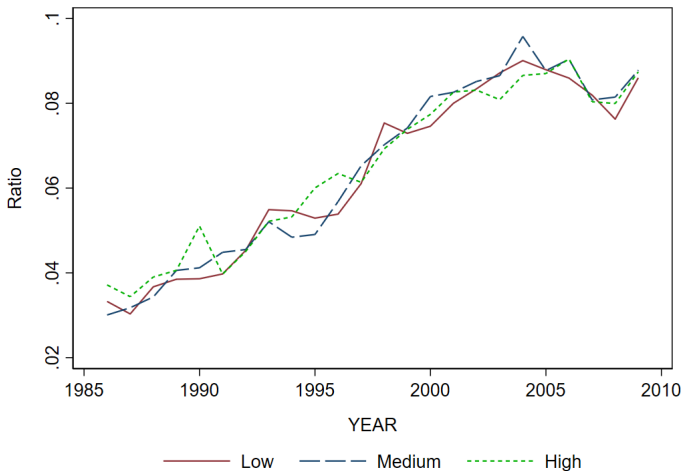


Figure: Childcare cost/Household expenditure

Interacting Channel 2: ... and fewer children.

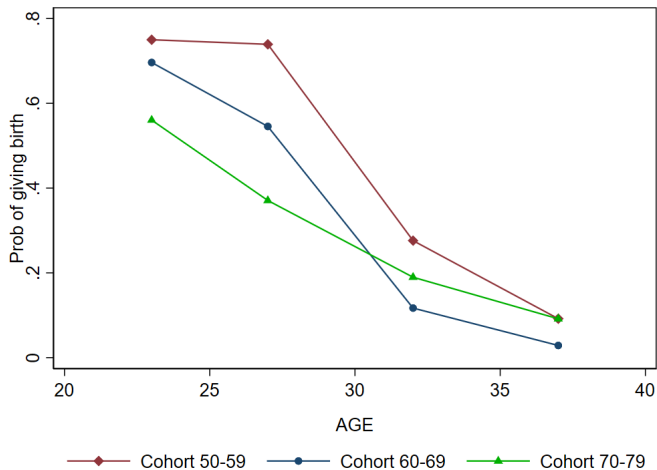


Figure: Probability of giving birth

Interacting Channel 3: Increase in assortative marriage.

- Assortative Marriage: People with similar education tend to marry each other.
- Decrease the chance for up-marriage: Less non-labor income for low-educated women → higher FLFP. Mixed effect for medium-educated women. measure

Table: Degree of assortative marriage (SEV index).

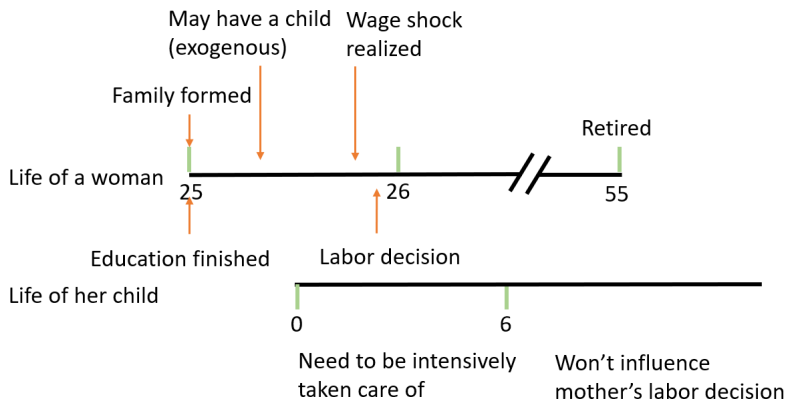
	Low-educated	Medium-educated	High-educated
Cohort 50-59	4.19	2.39	3.98
Cohort 60-69	4.25	2.47	4.43
Cohort 70-79	4.70	2.62	4.51

Higher number means higher degree of assortative marriage.

Summary of elements

- I build and estimate a structure model to study to the relative contribution of each channels:
- Increased wage at lower rate than men's.
- Increased childcare cost.
- Increased assortative marriage.

Outline of the Model



Setup of the Model

- A woman of cohort θ enters the economy at age 25 with a given education level e . Her age is a .
- She forms a family at this point according to the degree of assortative marriage.
- Once married, the woman will have a probability to have a child at each period (one child at most). Whether she has a child is N .
- She makes labor decision p at each period until age 54 (one period is 1 years).
- She needs to pay childcare cost κ if the child is younger (χ) and she works.

Setup of the Model

- By working, she accumulates experience S which will depreciate at a rate δ if she does not work.
- The man is always working.
- Annual income of the woman is given by a Mincer-type equation:

$$\ln y_a = b_0 + b_1 S_a + b_2 S_a^2 + \epsilon_a \quad (1)$$
$$\epsilon_a \sim N(0, \sigma)$$

$$S_a = S_{a-1} + p_{a-1}, \quad \text{if } p_{a-1} = 1$$
$$S_a = \delta S_{a-1}, \quad \text{if } p_{a-1} = 0 \quad (2)$$

- The husband's wage is:

$$\ln \tilde{y}_a = \tilde{b}_0 + \tilde{b}_1 a + \tilde{b}_2 a^2 \quad (3)$$

- $b_0, b_1, b_2, \sigma, \delta, \tilde{b}_0, \tilde{b}_1, \tilde{b}_2$ will be estimated separately for each (θ, e) .

Utility Function and Budget Constraint

- Utility function (n_a is equivalent scale):
(as Attanasio, Low, and Sánchez-Marcos 2008)

$$u(C_a, p_a; \theta, n_a, e) = \frac{(C_a/n_a)^{1-\rho}}{1-\rho} \exp[(1-p_a)\gamma_{1e}] - p_a\gamma_{2e} \quad (4)$$

$$V_a^\theta(Z_a) = \max_{\{p_\tau\}_{\tau=a,\dots,\bar{a}}} E \left\{ \sum_{\tau=a}^{\bar{a}} \beta^{\tau-a} u(C_a, p_a; \theta, n_a, e, \chi_a) | Z_a \right\} \quad (5)$$

State variable $Z_a(S_a, y_a, \tilde{y}_a, N_a, \chi_a)$

- The budget constraint:

$$y_a p_a + \tilde{y}_a = C_a + p_a \kappa_{\theta+a} \times \mathbb{1}(\chi_a = 1) \quad (6)$$

Estimation of Parameters

- β and ρ are exogenously set as 0.98 and 1.5 .
- $\tilde{b}_0, \tilde{b}_1, \tilde{b}_2$ are estimated from the data directly.
- Childcare cost, fertility rate, degree of assortative marriage are determined from the data.

Wage

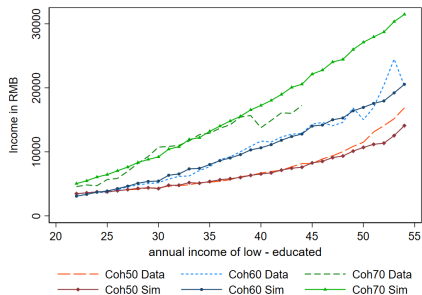
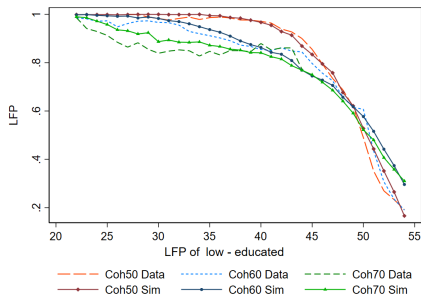
Estimation of Parameters: Simulated Method of Moments

- Rest parameters are estimated with SMM.
- γ_1, γ_2 are estimated jointly across cohorts for each education level.
- $\sigma, b_0, b_1, b_2, \delta$, are estimated for each education level and cohort separately.
- Targeted moments are FLFP and mean of wages from 25-54 whenever data is available(50 moments).
- Compare women in three cohorts: 1950-1959 & 1960-1969 & 1970-1979. LFP

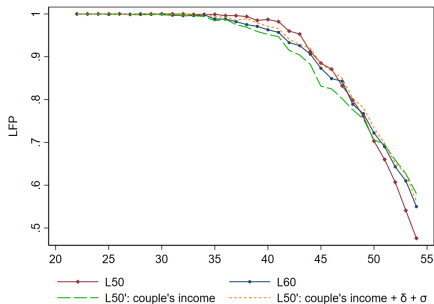
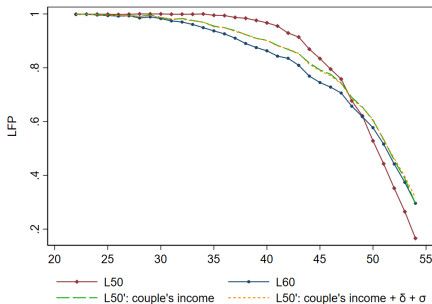
Estimation Results: Low-Educated Women

	Cohort 50	Cohort 60	Cohort 70
b_0	8.0312 (0.0006)	7.8992 (0.0013)	8.4555 (0.0059)
b_1	0.0335 (0.0003)	0.0878 (0.0002)	0.0914 (0.0005)
b_2	0.0001 (0.0000)	-0.0011 (0.0000)	-0.0012 (0.0000)
δ	0.1671 (0.0250)	0.1503 (0.0221)	0.0199 (0.0339)
σ	0.4712 (0.0075)	0.4925 (0.0092)	0.3172 (0.0168)
γ_1		-0.1863 (0.0029)	
γ_2		0.0001 (0.0000)	
χ^2	17.4	30.9	20.6

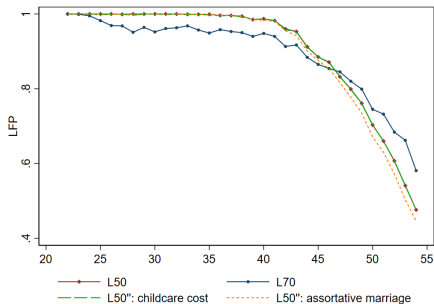
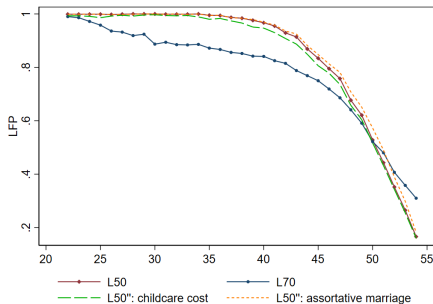
Fit of the Model (low-educated)



Counterfactual Study: Wage related parameters



Counterfactual Study: Family related parameters



- The unique trend of declining FLFP in urban China could be explained by a classical model.
- Counterfactual study:
 - Increased gender pay gap explains $\sim 70\%$ the changes in FLFP.
 - Increased childcare cost lowers 10% FLFP for low-educated women.
 - Increased assortative marriage has different effects.
- Mechanism:
 - Mostly driven by the widening gender pay gap.
 - Changes in family structures have significant but heterogeneous effects.

- Wage gap and FLFP, more to explore.
- 1/3 of countries or areas have experienced declined FLFP but few have a widening gender pay gap.
- Source of widening pay gap: gender discrimination or higher demand or technology for men?
- The model per se:
 - Include saving?
 - AR(1) or random walk income shock?
 - More building block?

Thanks for Attending!

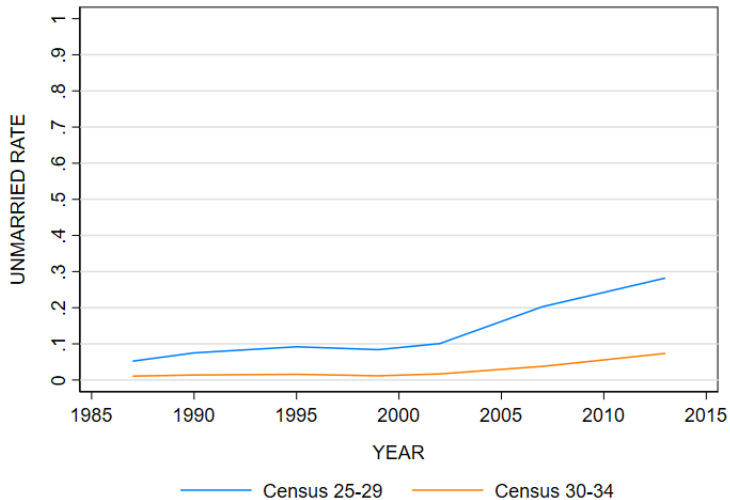
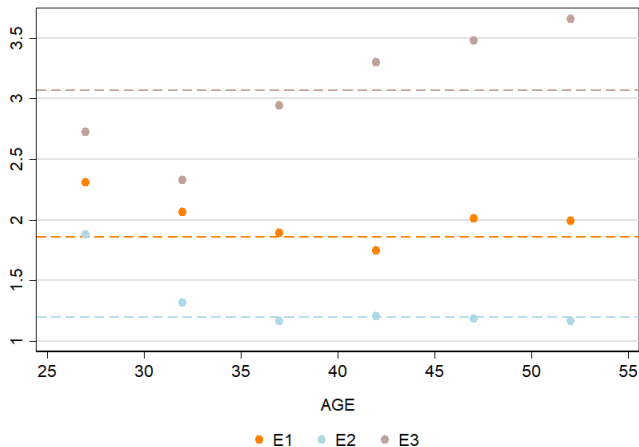


Figure: Unmarried rate of female.

- Measuring assortative marriage is never an easy job.
- Chiappori, Costa Dias, and Meghir (2020) propose a model-based measurement: [Back](#)

F\M	E1 (n)	E2 (1-n)
E1 (m)	r	$m-r$
E2 (1-m)	$n-r$	$1-n-m+r$

$$\begin{aligned}
 I_{SEV} &= \ln \left[\frac{r(1+r-m-n)}{(n-r)(m-r)} \right] \\
 I_L &= \frac{r}{mn} \\
 I_{WS} &= \frac{r^2}{mn} + \frac{(1+r-m-n)^2}{(1-m)(1-n)}
 \end{aligned} \tag{7}$$



Degree of assortative marriage within cohort 60-64 at different ages [Back](#)