China's Rebalancing and Gender Inequality

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Monetary Fund, its Executive Board or its Management.

Outline

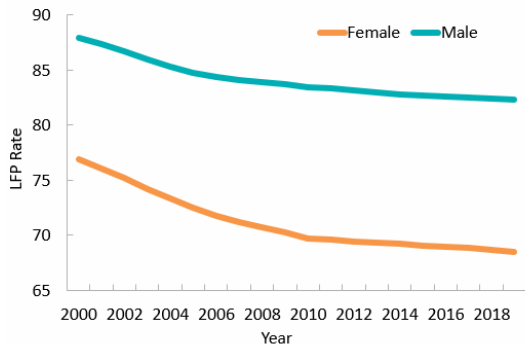# Fact 1: Declining LFP and widening gender LFP gap

Figure 1: LFP Rate in China

- ILO estimates of working-age population (15-64 y.o.) LFP

- Decreasing Labor Force Participation (LFP) Rates for Women and Men

- More Rapid Decline in Female LFP

- COVID-19 pandemic is exacerbating gender inequality

Fact 2: Widening gender earnings gap

Table 1: Widening Gender Earnings Gap

	1995 sample	2013 sample
Female	-0.119***	-0.351***
	(0.017)	(0.021)
Age	0.056***	0.078***
	(0.014)	(0.006)
$(Age)^2$	-0.001***	-0.001***
	(0.000)	(0.000)
Child in HH	-0.060*	-0.081***
	(0.034)	(0.020)
Married	0.044	0.095**
	(0.071)	(0.034)
Education		
High School	0.127***	0.171***
	(0.021)	(0.021)
College	0.402***	0.570***
	(0.026)	(0.043)
Voc. Training	0.280***	0.284***
	(0.016)	(0.032)
Urban	0.042	0.223***
	(0.099)	(0.030)
Service sector	0.059**	-0.011
	(0.026)	(0.021)
Constant	7.197***	8.723***
	(0.285)	(0.112)
Observations	13,015	40,620
R-squared	0.095	0.152

Notes: The dependent variable is real annual log wages. Robust standard errors are in parentheses. Omitted category in education attainment levels is "Less than High School." Omitted category in sector is goods sector.
*** p<0.01, ** p<0.05, * p<0.1
Source: CHIP and staff calculations.

- Estimate conditional gender gap in annual earnings:

$$\log(w_i) = \alpha^g + \beta_1^g \text{Female}_i + \beta_2^g X_i^g + \epsilon_i^g$$

- Data source: Chinese Household Income Survey.

- Conditional gender earnings gap doubled over two decades.
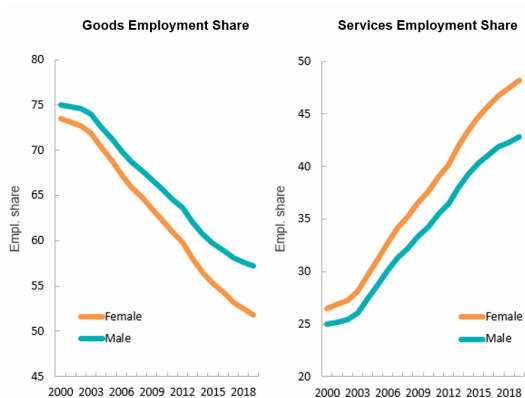
Fact 3: Rising services sector share

Figure 2: Structural Transformation in China

- Structural transformation trends are consistent with other advanced and emerging economies

- Declining goods sector (agriculture, mining, and manufacturing sectors) employment share

- Rising services sector employment share

- Women's revealed comparative advantage in services

Puzzle: Can we reconcile these 3 facts?

- Features of existing models of structural transformation:

    - Women have a comparative advantage in services ✓

    - As country develops, services share increases ✓

    - Rising services share boosts female employment ✗

    - Rising services share narrows gender wage gap ✗

- US: Ngai and Petrongolo (2017); Akbulut (2011); Rendall (2018)

- Brazil, India, Mexico, Thailand: Rendall (2013)

This paper

- Examine China's rebalancing from a gender perspective:
  - Structural transformation accompanied by widening gender gaps (contrary to the experience of advanced economies)
  - U-shaped relationship between income growth and FLFP

- Use micro-level data to examine drivers of widening gender gaps
  - Married women in urban areas driving the widening hours and earnings gaps
  - Rising female labor supply elasticity to spouse's wages
  - Women spending increasingly more time on home production

- Formalize the stylized facts in a model of structural transformation
  - Increase in productivity wedges (barriers to FLFP)
  - Counterfactuals: reducing barriers to FLFP and accelerating marketization of home-produced services

Related literature

- **Structural transformation and gender inequality**: Akbulut (2011), Ngai & Petrongolo (2017), Rendall (2018); Rendall (2013), Ostry et al. (2018); Goldin (1994), Ngai, Olivetti & Petrongolo (2021)

- **Female labor supply elasticities**: Blau and Kahn (2007), Heim (2007), Chen and Ge (2018)

- **Inequality in China**: Han, Liu, and Zhang (2012), Li, Loungani, & Ostry (2017), Dong & Joffre (2019), Liu, Li, & Yang (2014), Dasgupta, Matsumoto, & Xia (2015)

U-shaped relationship: FLFP and Economic Development

- Evidence of U-shaped relationship between FLFP rates and income growth:
  - First documented by Sinha (1965) and Goldin (1994);
  - Olivetti (2013) examines from cross-sectional and historical perspectives for advanced countries.

- Labor supply elasticity of married women
  - Changing LS elasticity over time – Blau and Kahn (2007);
  - Stigma against working married women – Jayachandran (2020).

U-shape

U-shaped relationship: Evidence from Chinese Provinces

Figure 3: Female employment and province-level income
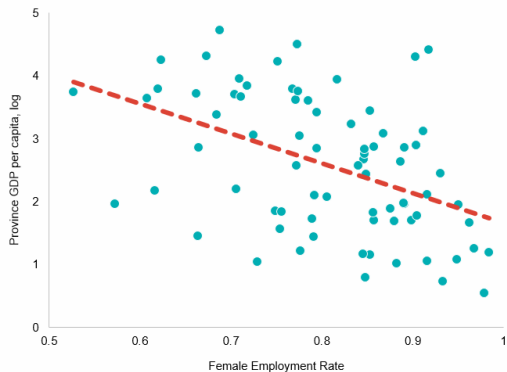
- FLFP and GDP per capita across provinces and time (1995 to 2013);

- Negative correlation between GDP per capita and labor force participation rates.

Married women are driving the widening hours and earnings gaps

Table 2: Differences in Gender Hours and Earnings Gaps for Married and Unmarried Workers

| | Gender Hours Gap | | Gender Earnings Gap | |
	1995	2013	1995	2013
Married	-0.027***	-0.033*	-0.153***	-0.395***
	(0.007)	(0.017)	(0.022)	(0.023)
Unmarried	-0.006	0.066***	-0.024	-0.090***
	(0.012)	(0.020)	(0.036)	(0.019)
Rural	-0.027	-0.024	-0.073	-0.357***
	(0.023)	(0.019)	(0.064)	(0.026)
Urban	-0.019***	-0.053***	-0.142***	-0.314***
	(0.006)	(0.008)	(0.017)	(0.020)

Notes: The dependent variable is log weekly work hours or log annual earnings. Coefficients on the female binary variable are reported. All regressions control for age, age squared, presence of children in the household, education level, and urban residence. Robust standard errors are in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Source: CHIP and staff calculations.

Measuring Women's Labor Supply Elasticity to Spouse's Wages

- Endogeneity concerns: measurement error, omitted variables, selection;

- 3-stage estimation: Heckman selection correction approach (stages 1 and 2) and IV approach (stage 3);

- Instrumental variables:
  - own wages: quadratic experience and county public employment share
  - spouse's wages: experience, quadratic experience, and county public employment share.

3-stage procedure

- Stage 1

$$p_i = \alpha^p + \beta_1^p \log(I_i) + \beta_2^p X_i^p + \epsilon_i^p$$

- Stage 2

$$\log(w_i) = \alpha^w + \beta_1^w \lambda_i + \beta_2^w X_i^w + \epsilon_i^w$$

- Stage 3

$$h_i = \alpha^h + \beta_1^h \log(\hat{w}_i) + \beta_2^h \log(w_i^s) + \beta_3^h \log(I_i) + \beta_4^h \lambda_i + \beta_5^h X_i^h + \epsilon_i^h$$

  – h_i – woman's annual hours of work
  – $p_i = 1$ if $h_i > 0$; $p_i = 0$ if $h_i = 0$
  – $\log(w_i)$ – woman's log hourly wages
  – $\log(w_i^s)$ – spouse's log hourly wages
  – $\log(I_i)$ – log of household total non-labor income
  – λ_i – inverse Mills ratio
  – X_i^h – woman's age, age squared, education, experience; spouse's age, age squared, education; presence of children in the household; province population and county dummies.

Rising female labor supply elasticity to spouse's wages

Table 3: Labor Supply Estimates for Married Women

	1995		2013	
	OLS	Three-Stage IV	OLS	Three-Stage IV
Log(Own Wage)	306.941**	110.385	939.414***	699.724***
	(139.178)	(167.927)	(181.013)	(172.555)
Log(Spouse Wage)	-112.564***	-161.875	-188.730***	-398.227***
	(13.397)	(163.813)	(19.120)	(116.162)
Log(Non-wage HH Income)	-3.205	-0.431	-7.087***	-18.532***
	(8.249)	(9.647)	(2.702)	(4.215)
Child in HH	3.211	25.908	-39.564*	-86.595**
	(13.232)	(30.647)	(21.678)	(34.640)
Observations	3,768	3,768	5,604	5,604
Elasticities (at mean annual hours)				
Own Log Wage	0.140	0.050	0.407	0.303
Spouse Log Wage	-0.051	-0.074	-0.082	-0.173

Notes: The dependent variable is married women's annual hours of work. All models include inverse Mills ratio, education, age, experience, spouse's age and education, county dummies, province population, and a constant. Own imputed hourly log wages are instrumented with experience squared, and share of the public sector in a county. Spouse hourly log wages are instrumented with spouse's experience, experience squared, and share of the public sector in a county. The sample includes urban population only. Bootstrapped standard errors are in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Source: CHIP and staff calculations.

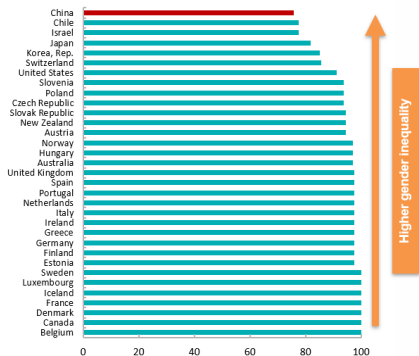# Bias and policy dimensions of gender gaps

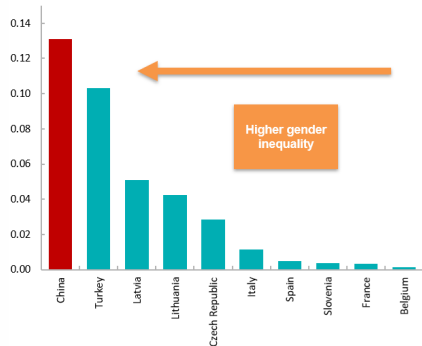Figure 4: Women, Business, and Law Index

Figure 5: Social Institutions and Gender Index

- World Economic Forum: China's ranking in the Global Gender Gap Index slipped from 63rd (out of 115 countries) in 2006 to 106th (out of 153 countries) position in 2020.

Bias and policy dimensions of gender gaps

- Uneven burden of child and elderly care
  - ▶ Decline in childcare support from the state (Connelly et al., 2018)
  - ▶ Rising childcare costs (Qin, 2019)

- Gender bias at work
  - ▶ Rise in gender-based hiring biases (Zhang & Huang, 2020)
  - ▶ Women underrepresented in professional and managerial positions

- Barriers to women's entrepreneurial activity
  - ▶ Female entrepreneurs are underrepresented
  - ▶ Discrimination in access to credit market

Putting the evidence together

Macro Evidence

- U-shape relationship: FLFP and income
- Negative corr. between province GDP growth and FLFP

Micro Evidence

- Women's LFP supply is increasingly more elastic to spouse's wages
- Married women drive widening wage gaps

Implications

- Gender norms reversal
- Are gains from economic growth shared equally?

Model of Structural Transformation

- Baseline: Ngai and Petrongolo (2017)

- 3 sectors
  - Goods: agriculture, mining, manufacturing, utilities, construction
  - Market Services: trade, transportation, hotels & entertainment, private households, public administration; finance, education, health, real estate
  - Home-produced Services: care services and chores

- Female workers have a comparative advantage in services

- Key prediction: structural transformation and marketization narrow gender wage and hours gaps

Model setup – Technology

- Goods and services ($j = g, s$) are produced using female (L_{fj}) and male (L_{mj}) labor.

$$Y_j = A_j L_j, \quad L_j = \left[\xi_j L_{fj}^{\frac{\eta-1}{\eta}} + (1 - \xi_j) L_{mj}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$

- Women have comparative advantage in services: $\xi_s > \xi_g$

- Labor productivity, A_j, grows faster in goods sector:

$$\frac{\dot{A_j}}{A_j} \equiv \gamma_j, \quad \gamma_g > \gamma_s$$

Model setup – Households

- Households derive utility from consuming goods and services:

$$U(c_g, c_s, c_h) = \ln c, \quad c = \left[\omega c_g^{\frac{\epsilon-1}{\epsilon}} + (1-\omega)c_z^{\frac{\epsilon-1}{\epsilon}}\right]^{\frac{\epsilon}{\epsilon-1}}$$

- c_z are a CES composite of market- and home-produced services:

$$c_z = \left[\psi c_s^{\frac{\sigma-1}{\sigma}} + (1-\psi)c_h^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}$$

- $\epsilon < 1$ – services and goods are complements in consumption

- $\sigma > 1$ – home- and market-produced services are substitutes

Model setup – Households

- Women and men produce home services:

$$c_h = A_h \left[\xi_h L_{fh}^{\frac{\eta-1}{\eta}} + (1-\xi_h) L_{mh}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$

- $\gamma_h < \gamma_s$ – market services productivity grows faster

- Budget constraint:

$$p_g c_g + p_s c_s = w_m(L_m - L_{mh}) + w_f(L_f - L_{fh})$$

Model setup – Equilibrium

- An equilibrium consists of market wages, prices, consumption, and male and female time allocation such that

  1. profits and household utility are maximized
  2. wages and sector prices clear the markets: $c_j = Y_j$, $j = g, s$
  3. male and female labor markets clear: $L_{ig} + L_{is} = L_i - L_{ih}$, $i = f, m$

- Productivity wedge, π_j, in $\xi_j = \pi_j \chi_j$:

$$\frac{w_f}{w_m} = \frac{\pi_j \chi_j}{1 - \pi_j \chi_j} \left(\frac{L_{mj}}{L_{fj}} \right)^{\frac{1}{\eta}}$$

- π_j varies over time.

Model predictions

- Faster productivity growth in goods sector $\rightarrow$ service sector expansion $\rightarrow$ rise in women's relative wages.

- Faster productivity growth in market sectors $\rightarrow$ marketization of home-produced services $\rightarrow$ women move to market sectors.

- Changes in productivity wedges explain within-sector changes in female labor intensity, not explained by uneven productivity growth.

Calibration

- Data
  - Sector employment and productivity: ILO, WB, Bridgman et al. (2018)
  - Wages and hours: CHIP, China Health and Nutrition Survey

- SS Equilibria in 2000 and 2013

- Parameters
  - Set η and ξ_j to US 2008 values (no FLFP barriers case).
  - Back out π_j in 2000 and 2013.

- Counterfactuals:
  - Reduce π_j to 1 – no barriers to FLFP (relative to the US in 2008).
  - Marketization: increase market sector productivity growth relative to home production.

Parameters

Productivity wedges

- $\pi_j < 1$ – wedge lowers gender wage ratio relative to MRTS

- $\pi_j = 1$ in the US (2008), calculate π_j in 2000 and 2013 in China

Table 4: Sector-specific Barriers to Female Employment

	2000	2013
π_g	1.27	1.03
π_s	0.86	0.70

Notes: Female employment barriers are derived by matching changes in goods (market services) hours and wage ratios in 2000 and 2013.

Counterfactual 1: Narrowing productivity wedges

- Counterfactual: set $\pi_j = 1$ in 2000 and 2013 (no FLFP barriers relative to US)

- Gender wage gap narrows

- LFP gap narrows

Table 5: Counterfactual Results

	Wage Gap		Market Hours Gap	
	2000	2013	2000	2013
Data	84.4	64.9	46.6	41.3
Model Baseline	84.4	69.1	46.6	35.9
Counterfactual 1: $\pi_g^\star = \pi_s^\star = 1$	77.9		72.8	

Source: CHIP, CHNS, ILO, World Bank, and staff calculations

Counterfactual 2: Narrowing productivity wedges and accelerating marketization

- Accelerate marketization process (investment in childcare, increasing productivity in the market service sector, etc.)

Table 6: Productivity growth differentials

	Baseline	Counterfactual
$\gamma_g - \gamma_s$	3.7	3.7
$\gamma_s - \gamma_h$	4.1	6.2

Counterfactual 2: Narrowing productivity wedges and accelerating marketization

- Narrow productivity wedges and accelerate marketization process

- Gender wage gap narrows further

- Sizeable impact on LFP gap

Table 7: Counterfactual Results

	Wage Gap		Market Hours Gap	
	2000	2013	2000	2013
Model Baseline	84.4	69.1	46.6	35.9
Counterfactual 1: $\pi_g^\star = \pi_s^\star = 1$	77.9		72.8	
Counterfactual 2: $\pi_g^\star = \pi_s^\star = 1$ and $\gamma_s^\star > \gamma_s$	78.1		77.7	

Source: CHIP, CHNS, ILO, World Bank, and staff calculations

Policy implications

- Ensuring affordable child and elderly care
  - ▶ direct provision of care services and care-related infrastructure
  - ▶ public subsidies, tax credits, and care credits
  - ▶ paternal leave policies
  - ▶ workplace flexibility

- Enforcing legal regulations and reducing gender bias at work
  - ▶ aligning pension ages for women and men
  - ▶ strengthening implementation of laws to prohibit discrimination in hiring and firing
  - ▶ supporting women's career development (mentoring, training)

- Support for Women's Entrepreneurship
  - ▶ implementation of anti-discrimination laws
 - ▶ targeted funding for women

Summing up

- Gender inequality from a rebalancing perspective;
  - ▶ Sharp rise in gender gaps in China, albeit rising services sector share;
  - ▶ Increasing female labor supply elasticities over time;
  - ▶ Increasingly pertinent topic as legacy of one-child policy unfolds;
  - ▶ Gender inequality is being exacerbated during the pandemic.

- Considerable room of policy response.
  - ▶ Child and elderly care support;
  - ▶ Enforcing legal regulations;
  - ▶ Supporting women in the workforce.

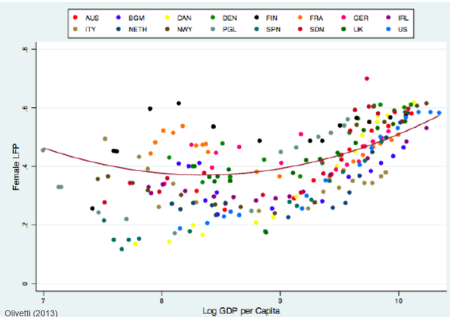- Ongoing work: extending the model to explicitly capture income effects.

Appendix

U-shaped relationship: FLFP and Economic Development

Historical Perspective
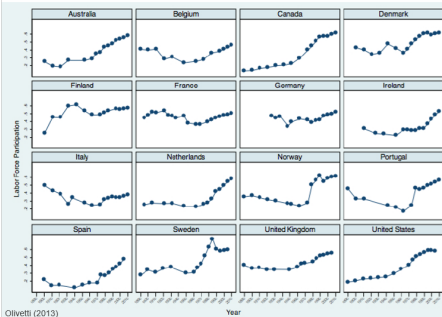
Cross-Sectional Perspective

Back

Calibration

Table 8: Model Parameters

Parameter	Value	Source
$\gamma_g - \gamma_s$	0.037	World Bank, ILO, CHIP
$\gamma_s - \gamma_h$	0.041	World Bank, ILO, CHIP, Bridgman et al. (2018)
σ	2.0	Aguiar, Hurst, and Karabarbounis (2012)
ϵ	0.002	Herrendorf, Rogerson, and Valentinyi (2013)
η	2.27	Ngai and Petrongolo (2017)
χ_g	0.29	Ngai and Petrongolo (2017)
χ_s	0.43	Ngai and Petrongolo (2017)
L_m/L_f	1.05	Match service share in 2000, given male and female service and market hours
ξ_h	0.48	Match wage and hours ratios in 2013

Back