China’s Rebalancing and Gender Inequality

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Outline

1. Empirical puzzle
2. Drivers of widening wage gap
3. Model of structural transformation
4. Counterfactual scenarios
5. Concluding remarks
Fact 1: Declining LFP and widening gender LFP gap

- 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

Figure 1: LFP Rate in China
Fact 2: Widening gender earnings gap

Table 1: Widening Gender Earnings Gap

<table>
<thead>
<tr>
<th></th>
<th>1995 sample</th>
<th>2013 sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>-0.119***</td>
<td>-0.351***</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>Age</td>
<td>0.056***</td>
<td>0.078***</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>(Age)$^2$</td>
<td>-0.001***</td>
<td>-0.001***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Child in HH</td>
<td>-0.060*</td>
<td>-0.081***</td>
</tr>
<tr>
<td></td>
<td>(0.034)</td>
<td>(0.020)</td>
</tr>
<tr>
<td>Married</td>
<td>0.044</td>
<td>0.095**</td>
</tr>
<tr>
<td></td>
<td>(0.071)</td>
<td>(0.034)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School</td>
<td>0.127***</td>
<td>0.171***</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>College</td>
<td>0.402***</td>
<td>0.570***</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.043)</td>
</tr>
<tr>
<td>Voc. Training</td>
<td>0.280***</td>
<td>0.284***</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>Urban</td>
<td>0.042</td>
<td>0.223***</td>
</tr>
<tr>
<td></td>
<td>(0.099)</td>
<td>(0.030)</td>
</tr>
<tr>
<td>Service sector</td>
<td>0.059**</td>
<td>-0.011</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>Constant</td>
<td>7.197***</td>
<td>8.723***</td>
</tr>
<tr>
<td></td>
<td>(0.285)</td>
<td>(0.112)</td>
</tr>
</tbody>
</table>

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.

- Estimate conditional gender gap in annual earnings:
  \[
  \log(w_i) = \alpha^g + \beta^g_{1}\text{Female}_i + \beta^g_{2}X_i^g + \epsilon_i^g
  \]

- Data source: Chinese Household Income Survey.

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

- 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

Figure 2: Structural Transformation in China
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


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);
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

<table>
<thead>
<tr>
<th></th>
<th>Gender Hours Gap</th>
<th></th>
<th>Gender Earnings Gap</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>-0.027***</td>
<td>-0.033*</td>
<td>-0.153***</td>
<td>-0.395***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.017)</td>
<td>(0.022)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Unmarried</td>
<td>-0.006</td>
<td>0.066***</td>
<td>-0.024</td>
<td>-0.090***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.020)</td>
<td>(0.036)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>Rural</td>
<td>-0.027</td>
<td>-0.024</td>
<td>-0.073</td>
<td>-0.357***</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.019)</td>
<td>(0.064)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>Urban</td>
<td>-0.019***</td>
<td>-0.053***</td>
<td>-0.142***</td>
<td>-0.314***</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.008)</td>
<td>(0.017)</td>
<td>(0.020)</td>
</tr>
</tbody>
</table>

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**

\[ p_i = \alpha_p + \beta_{1p} \log(I_i) + \beta_{2p} X_{i}^p + \epsilon_i^p \]

- **Stage 2**

\[ \log(w_i) = \alpha_w + \beta_{1w} \lambda_i + \beta_{2w} X_{i}^w + \epsilon_i^w \]

- **Stage 3**

\[ h_i = \alpha_h + \beta_{1h} \log(\hat{w}_i) + \beta_{2h} \log(w_i^s) + \beta_{3h} \log(I_i) + \beta_{4h} \lambda_i + \beta_{5h} X_i^h + \epsilon_i^h \]

- \( h_i \) – 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
- \( \lambda_i \) – 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

<table>
<thead>
<tr>
<th></th>
<th>1995 OLS</th>
<th>1995 Three-Stage IV</th>
<th>2013 OLS</th>
<th>2013 Three-Stage IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(Own Wage)</td>
<td>306.941**</td>
<td>110.385</td>
<td>939.414***</td>
<td>699.724***</td>
</tr>
<tr>
<td></td>
<td>(139.178)</td>
<td>(167.927)</td>
<td>(181.013)</td>
<td>(172.555)</td>
</tr>
<tr>
<td>Log(Spouse Wage)</td>
<td>-112.564***</td>
<td>-161.875</td>
<td>-188.730***</td>
<td>-398.227***</td>
</tr>
<tr>
<td></td>
<td>(13.397)</td>
<td>(163.813)</td>
<td>(19.120)</td>
<td>(116.162)</td>
</tr>
<tr>
<td>Log(Non-wage HH Income)</td>
<td>-3.205</td>
<td>-0.431</td>
<td>-7.087***</td>
<td>-18.532***</td>
</tr>
<tr>
<td></td>
<td>(8.249)</td>
<td>(9.647)</td>
<td>(2.702)</td>
<td>(4.215)</td>
</tr>
<tr>
<td>Child in HH</td>
<td>3.211</td>
<td>25.908</td>
<td>-39.564*</td>
<td>-86.595**</td>
</tr>
<tr>
<td></td>
<td>(13.232)</td>
<td>(30.647)</td>
<td>(21.678)</td>
<td>(34.640)</td>
</tr>
<tr>
<td>Observations</td>
<td>3,768</td>
<td>3,768</td>
<td>5,604</td>
<td>5,604</td>
</tr>
</tbody>
</table>

Elasticities (at mean annual hours)

<table>
<thead>
<tr>
<th></th>
<th>Own Log Wage</th>
<th>Spouse Log Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995 OLS</td>
<td>0.140</td>
<td>-0.051</td>
</tr>
<tr>
<td>1995 Three-Stage IV</td>
<td>0.050</td>
<td>-0.074</td>
</tr>
<tr>
<td>2013 OLS</td>
<td>0.407</td>
<td>-0.082</td>
</tr>
<tr>
<td>2013 Three-Stage IV</td>
<td>0.303</td>
<td>-0.173</td>
</tr>
</tbody>
</table>

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.
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.

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

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

- Labor productivity, \(A_j\), grows faster in goods sector:

\[
\frac{\dot{A}_j}{A_j} \equiv \gamma_j, \quad \gamma_g > \gamma_s
\]
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
Women and men produce home services:

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

\( \gamma_h < \gamma_s \) – 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: \( c_j = Y_j, \quad j = g, s \)
  3. male and female labor markets clear: \( L_{ig} + L_{is} = L_i - L_{ih}, \quad i = f, m \)

- Productivity wedge, \( \pi_j \), in \( \xi_j = \pi_j \chi_j \):

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

- \( \pi_j \) varies over time.
Model predictions

- Faster productivity growth in goods sector → service sector expansion → rise in women’s relative wages.

- Faster productivity growth in market sectors → marketization of home-produced services → 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 $\eta$ and $\xi_j$ to US 2008 values (no FLFP barriers case).
- Back out $\pi_j$ in 2000 and 2013.

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

- $\pi_j < 1$ – wedge lowers gender wage ratio relative to MRTS
- $\pi_j = 1$ in the US (2008), calculate $\pi_j$ in 2000 and 2013 in China

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\pi_g$</td>
<td>1.27</td>
<td>1.03</td>
</tr>
<tr>
<td>$\pi_s$</td>
<td>0.86</td>
<td>0.70</td>
</tr>
</tbody>
</table>

**Table 4: Sector-specific Barriers to Female Employment**

**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

<table>
<thead>
<tr>
<th></th>
<th>Wage Gap</th>
<th>Market Hours Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>2013</td>
</tr>
<tr>
<td>Data</td>
<td>84.4</td>
<td>64.9</td>
</tr>
<tr>
<td>Model Baseline</td>
<td>84.4</td>
<td>69.1</td>
</tr>
<tr>
<td>Counterfactual 1: ( \pi_g^* = \pi_s^* = 1 )</td>
<td>77.9</td>
<td></td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Table 6: Productivity growth differentials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>(\gamma_g - \gamma_s)</td>
</tr>
<tr>
<td>(\gamma_s - \gamma_h)</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th></th>
<th>Wage Gap</th>
<th>Market Hours Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>2013</td>
</tr>
<tr>
<td>Model Baseline</td>
<td>84.4</td>
<td>69.1</td>
</tr>
<tr>
<td>Counterfactual 1: $\pi_g^* = \pi_s^* = 1$</td>
<td></td>
<td>77.9</td>
</tr>
<tr>
<td>Counterfactual 2: $\pi_g^* = \pi_s^* = 1$ and $\gamma_s^* &gt; \gamma_s$</td>
<td></td>
<td>78.1</td>
</tr>
</tbody>
</table>

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

Olivetti (2013)
## Calibration

### Table 8: Model Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\gamma_g - \gamma_s$</td>
<td>0.037</td>
<td>World Bank, ILO, CHIP</td>
</tr>
<tr>
<td>$\gamma_s - \gamma_h$</td>
<td>0.041</td>
<td>World Bank, ILO, CHIP, Bridgman et al. (2018)</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>2.0</td>
<td>Aguiar, Hurst, and Karabarbounis (2012)</td>
</tr>
<tr>
<td>$\epsilon$</td>
<td>0.002</td>
<td>Herrendorf, Rogerson, and Valentinyi (2013)</td>
</tr>
<tr>
<td>$\eta$</td>
<td>2.27</td>
<td>Ngai and Petrongolo (2017)</td>
</tr>
<tr>
<td>$\chi_g$</td>
<td>0.29</td>
<td>Ngai and Petrongolo (2017)</td>
</tr>
<tr>
<td>$\chi_s$</td>
<td>0.43</td>
<td>Ngai and Petrongolo (2017)</td>
</tr>
<tr>
<td>$L_m/L_f$</td>
<td>1.05</td>
<td>Match service share in 2000, given male and female service and market hours</td>
</tr>
<tr>
<td>$\xi_h$</td>
<td>0.48</td>
<td>Match wage and hours ratios in 2013</td>
</tr>
</tbody>
</table>