Gender, Work and Structural Transformation

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STEG Workshop
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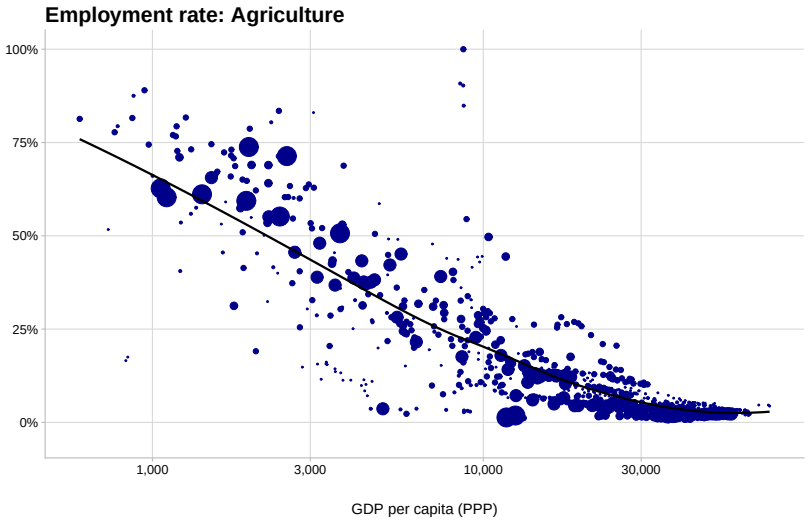
Development is accompanied by structural change out of agriculture



This paper

1. Document differences in structural change and employment by gender.
   - Standard theory of structural change does not apply to females
   - Large gender employment gaps across sectors (ag/non-ag) and location.
   - Differences in household employment composition

> Differences in rural/urban female employment act as a mobility cost.

2. Write down model of labor supply provision that features:
   - income effects.
   - preferences for market vs home work
   - return of market work vs home

> Focus on the gender dimension of structural change out of agriculture in LIC.

Introduction: Literature

- U-shaped pattern of female labor force participation [Sinha, 1965, Goldin, 1994, Boserup, 1970, Lee et al., 2008, Hare, 2016], Ngai, Olivetti, and Petrongolo (2021).
- Gender and structural transformation in the context of middle/high-income countries. [Olivetti, 2013, Moro et al., 2017, Cuberes and Teignier, 2016, Ngai and Petrongolo, 2017, Rendall, 2018]
- Measurement of time use, leisure, and home production [Aguiar and Hurst, 2007, Ramey and Francis, 2009, Bick et al., 2018, Bridgman et al., 2018]
- Family economics [Greenwood et al., 2017]
- Gender, Talent allocation and structural change - Kleineberg and Chiplunkar (2021), [Hsieh et al., 2019]

Outline

1. Harmonized World Labor Force Survey (HWLFS)
2. Stylized facts
3. Model of household labor provision
4. Calibration to a representative LIC
5. Counterfactual analysis
    - Effect of gender norms, labor market wedge and TFP on ag. employment and GDP.

Data: Harmonized World Labor Force Survey

A large scale micro dataset that we assembled.

- Harmonize demographic, education, household and labor market information.
- Household, labor force surveys and censi from 90 + countries.
- Nests IPUMS Intl., IPUMS-US historical and EU-LFS.
- 1000+ country-year surveys.
- Observations: $\approx$ 200 mio. individuals.
- Coverage: \$120 (ETH 1999) - \$115'000 (LUX 2018)
- Sample: working-age population aged 15-65.

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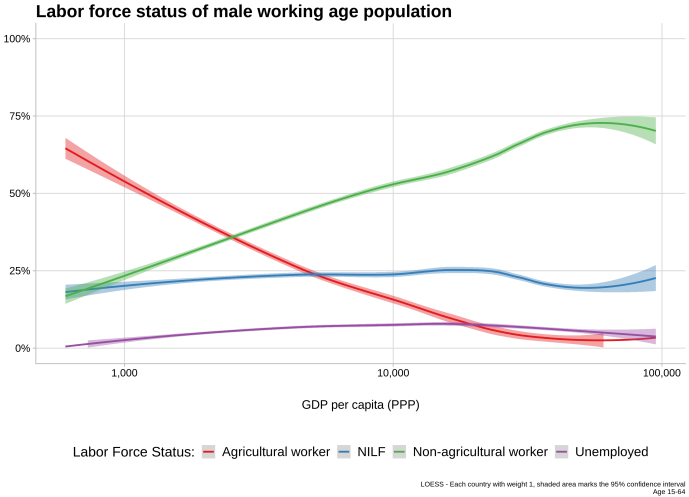
Today use information on:

- Demographics : gender, marital status, age.
- Employment: status, sector or location (urban/rural).
- Wages : hourly wages.

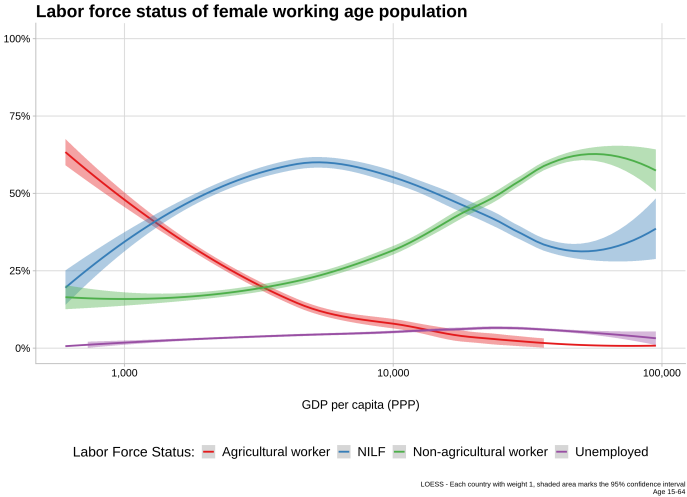
Fact 1: Structural change by gender



- Employment rate → - 1: Agriculture ↓ ; 2: Non-agriculture ↑

→ *Standard theory of structural change.*

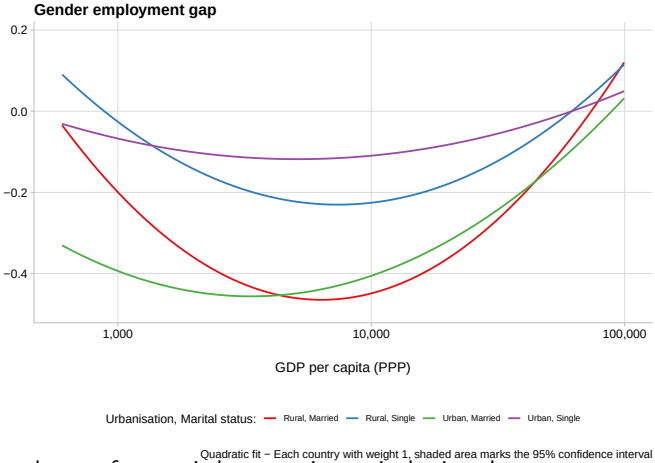
Fact 1: Structural change by gender



- Employment rate is U-shaped - 1: Ag ↓ ; NILF ↑ - 2: NILF ↓ ; Non-ag ↑

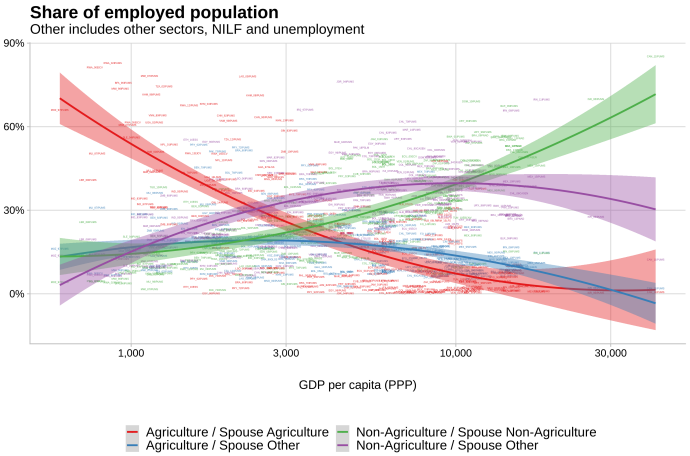
→ *Not the standard theory of structural change.*

Fact 2: Gender employment gap by marital status and location



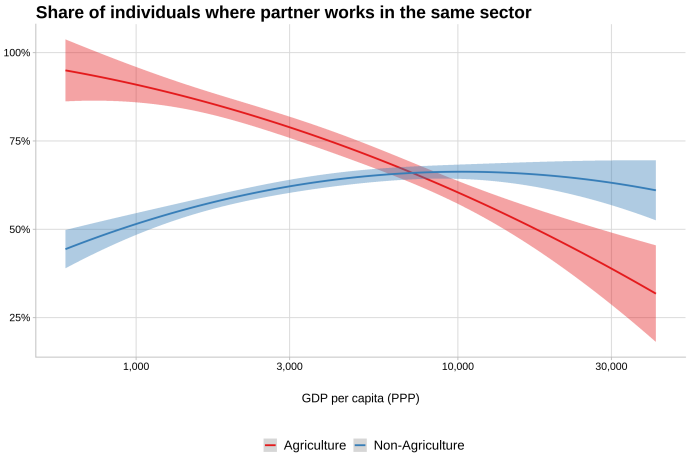
- Employment gap largest for married women in particular in urban areas.
- Robust to controlling for age and education.

Fact 3: Household employment choices



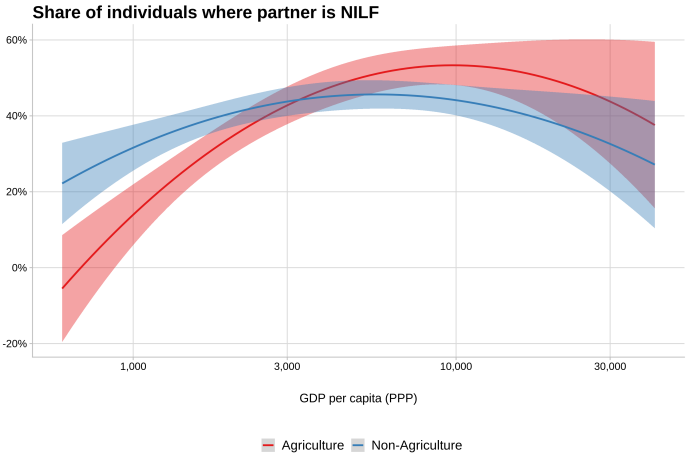
- With development, drop in agricultural employment is driven by drop in joint employment in agriculture.

Fact 3: Household employment choices



- In LIC, high share of dual earners in agriculture

Fact 3: Household employment choices



Quadratic fit - Each country with weight 1, shaded area marks the 95% confidence interval
Surveys with industry information available for WW / SE. Working age population (Age 15-65).
Partner definition = same household, other gender, married.

- 25% of non-agricultural workers have a spouse that is NILF.

Implications:

- Location choices result from
  - > labor income, amenities for singles and married, and
  - > spousal labor income for married households.
- Factors reducing married female urban employment act as a mobility cost

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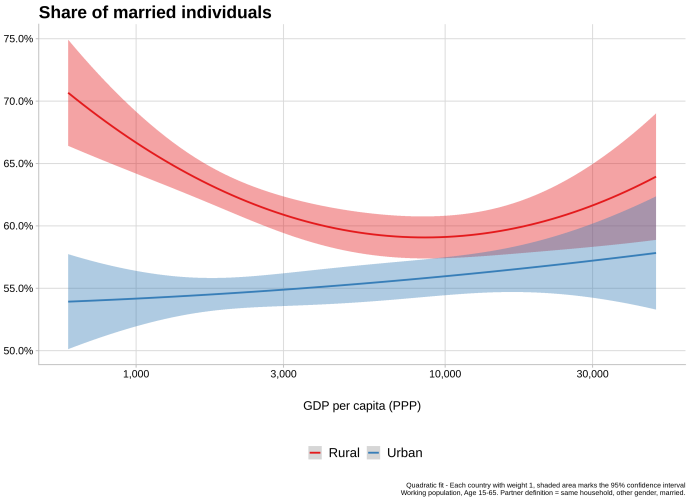
- Location choices result from
  - > labor income, amenities for singles and married, and
  - > spousal labor income for married households.
- Factors reducing married female urban employment act as a mobility cost
- Supporting evidence:
  1. Higher marriage rate in rural areas
  2. Married males more likely to be in rural area than single males

Marriage rate by rural/urban



In low-income countries, share of married individuals is higher in rural areas.

Married male location choices and female employment opportunities

	Urbanization rate of married males	
	(1)	(2)
Urbanization rate of single males	0.98***	0.97***
	(0.01)	(0.01)
ER of female-married-urban	0.17***	0.16***
	(0.01)	(0.02)
ER of female-married-rural	−0.18***	−0.18***
	(0.01)	(0.01)
Log GDP per capita		0.01***
		(0.002)
Constant	−0.0001	−0.04***
	(0.01)	(0.01)
Observations	790	786
R^2	0.96	0.96
Note:	*p<0.1; **p<0.05; ***p<0.01	

- Urbanisation rate of married males is positively correlated with urban FER.

Model

- Write down a model of labor supply provision.
  - Married and single households
  - Preference for market and home produced goods (ω)
  - Preferences for market and home work (χ) ▸ NILF: housework
  - Gender gaps (h) in return to market work ▸ Gender wage gaps ▸ HHI: occupations
- Use model to study their role in driving the structural change out of agriculture.

Model:

- Three types of households
  - > Differ by marital status and gender.
  - > Households choose market (L_m), home hours (L_h) and sector/location to maximize utility.
- Two sectors:
  - > Agricultural production takes place in rural area,
  - > Non-agricultural production takes place in urban area.

Model: Single households

- Household derives utility from consumption and disutility of work

$$u = \frac{c^{1-\sigma}}{1-\sigma} - \xi \frac{L^{1+1/\phi}}{1+1/\phi},$$

- Disutility from both market (L_m) and home (L_h) labor supply.

$$L = \chi L_m + (1-\chi) L_h.$$

- Consume home goods (c_h) and market goods (c_m).

$$c = \left[(1-\omega)\, c_m^{\frac{\varepsilon-1}{\varepsilon}} + \omega c_h^{\frac{\varepsilon-1}{\varepsilon}} \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

- Preference structure is borrowed from [Boerma and Karabarbounis, 2017].

Model: Single households: Budget constraints

- Market goods are either agricultural goods (c_a) or non-agricultural goods (c_n).

$$c_m = \left[\theta c_a^{\frac{\psi-1}{\psi}} + (1-\theta) c_n^{\frac{\psi-1}{\psi}}\right]^{\frac{\psi}{\psi-1}}$$

- Income from market work is spent on ag. and non-ag. goods.

$$p_a c_a + c_n = P c_m = w \boldsymbol{h} L_m$$

- Home hours are used to produce a home good.

$$c_h = z L_h$$

Model: Single households: Allocation

- **Provision of market work:**

$$(L_m)^{\sigma+1/\phi} = \left(\frac{1-\omega}{\chi}\right)^{\frac{\varepsilon(1-\sigma)}{\varepsilon-1}} \left(\frac{wh}{P}\right)^{1-\sigma} \frac{1}{\xi} (\Theta)^{\frac{1-\sigma\varepsilon}{\varepsilon-1}-\frac{1}{\phi}}$$

  - *Substitution effect:* ω and χ decrease share of market work, while h increases market work if $\sigma\varepsilon > 1$ (via $(\Theta(\overbrace{h}^{-}, \overbrace{\chi}^{+}, \overbrace{\omega}^{+}))$
  - *Level :* χ and ω decreases market work. h may increase / decrease market work.

- **Sectoral indifference condition:**

$$(1-\omega_a)^{\varepsilon} \left(\frac{w_a h_a}{P\chi_a}\right)^{\varepsilon-1} + \omega_a{}^{\varepsilon} \left(\frac{z_h}{1-\chi_a}\right)^{\varepsilon-1} = (1-\omega_n)^{\varepsilon} \left(\frac{w_n h_n}{P\chi_a}\right)^{\varepsilon-1} + \omega_n{}^{\varepsilon} \left(\frac{z_h}{1-\chi_n}\right)^{\varepsilon-1}$$

  - h increases utility if $\varepsilon>1$. ω and χ can increase or decrease utility.

Model: Married households: Preferences & budget

- Married households pool resources and maximize weighted sum of utilities.

$$u = \lambda \left(\frac{c^{m1-\sigma}}{1-\sigma} - \xi \frac{(\chi^m L_m^m)^{1+1/\phi}}{1+1/\phi} \right) + (1-\lambda) \left(\frac{c^{f1-\sigma}}{1-\sigma} - \xi \frac{L^{f1+1/\phi}}{1+1/\phi} \right)$$

- Married males do not supply labor towards home production such that $L_h^m = 0$.
- Female provision of labor : $L^f = \chi^f L_m^f + (1-\chi^f) L_h$
- Consumption of market goods is rival, while home goods is non-rival.

$$P(c_m^m + c_m^f) = w^m L_m^m + w^f \boldsymbol{h}^f L_m^f$$
$$p_a c_a^j + c_n^j = P c_m^j, \quad j = m, f$$

- Female home hours are used to produce a home good ($c_h = z_h L_h$)

Model: Married households: Allocation

Married female market work:

$$L_m^{f\ \sigma+\frac{1}{\phi}} = \frac{\frac{w^f \boldsymbol{h}^f}{P}}{\left(\frac{w^m \frac{L_m^m}{L_m^f} + w^f \boldsymbol{h}^f}{P}\right)^{\sigma}} \Lambda(\boldsymbol{\chi}^f, \boldsymbol{h}^f, \boldsymbol{\omega}).$$

- If $L_m^m = 0$, the post-wedge wage would enter as for singles.
- Male labor income controls the income effect of wages on female market work.

Model: Firms

CES production function using four types of labor inputs:

$$Y = A\left[\sum_j \mu^j N^{j\rho}\right]^{1/\rho}, \quad j \in \{fu, fs, mu, ms\}.$$

where weights μ^j for input type j and $\rho < 1$ controls the substitutability of inputs.

Within each sector, gender wage gaps by marriage type are

$$\frac{w^{fi}}{w^{mi}} = \frac{\mu^{fi}}{\mu^{mi}}\left(\frac{N^{fi}}{N^{mi}}\right)^{\rho-1}, \quad i = s, m.$$

Sectoral wage gaps by type are

$$\frac{w_n^j}{w_a^j} = \frac{\mu_n^j}{p_a \mu_a^j}\left(\frac{A_n}{A_a}\right)^{\rho}\left(\frac{Y_n/N_n^j}{Y_a/N_a^j}\right)^{1-\rho}.$$

Model: Equilibrium

An equilibrium consists of $p_a, \pi^j, w_k^j, L_{mk}^j, k = a, n, j = fs, ms, fu, mu$, such that

1. households choose their location optimally,
2. households choose market and home labor supply optimally,
3. firms choose inputs optimally, and
4. goods and labor markets clear.

Goods market clearing condition:

$$\frac{Y_a}{Y_n} = \frac{C_a}{C_n} = \left(\frac{\omega_a}{1-\omega_a}\right)^{\psi} p_a^{-\psi}$$

Calibration:

- We calibrate the model to a representative low-income country at 1'000 GDP pc ppp.

- We proceed in 3 steps

  1. Parametrize global parameters.

  2. Use aggregate employment rates and wage gaps to get supply side parameters.

  3. Calibrate χ, h, ω using employment rates by location, gender, marital status.

Calibration: Parametrization

Parameter		
Frisch elasticity	ϕ	2
Risk aversion	σ	1.1
Elasticity of substitution ag./non-ag	ψ	3.6
Elasticity of substitution home./market good	ε	2
Substitutability labor inputs	ρ	0.85
Labor productivity of home production	z	1

Parameter	
Marriage rate	0.625
Share of singles in rural area	0.8
Share of married in rural area	0.67
Share of males in population	0.67

Calibration:

Parameter		
Labor Input weights	μ	wage gaps
Labor input	N	employment rates
Agricultural production	Y_a	set $A_a = 1$
Non-Ag. TFP	A_n	Non-ag. firm FOC
Price of agricultural good	p_a	Ag. firm FOC
Pref. for ag. goods	θ	Goods market clearing

- Use data on urban, gender, and marital wage gaps and employment rates to back out value of labor inputs
- Use firm FOC's and market clearing condition to back out A_n,p_a, and θ

▸ Marriage premium ▸ Urban premium ▸ Gender gap ▸ Employment rates by gender x marital x urban

Calibration: strategy

Household type	Agriculture			Non-Agriculture		
Single males	ω_a^s	1	$\chi_{s,a}^m$	ω_n^s	1	$\chi_{s,n}^m$
Single females	ω_a^s	h_a^s	$\chi_{s,a}^f$	ω_n^s	h_n^s	$\chi_{s,n}^f$
Married females	ω_a^u	h_a^u	$\chi_{u,a}^f$	ω_n^u	h_n^u	$\chi_{u,n}^f$
Married males	ω_a^u	1	$\chi_{u,a}^m$	ω_n^u	1	$\chi_{u,n}^m$

- Ideally, we would like to estimate 20 parameters.
- We have 11 empirical moments: 8 employment shares and 3 sectoral shares.
- Need to make some assumptions.

▸ Marriage premium ▸ Urban premium ▸ Gender gap ▸ Employment rates by gender x marital x urban

Calibration: strategy

Household type	Agriculture			Non-Agriculture		
Single males	ω_a^s	1	χ_s^m	ω_n^s	1	χ_s^m
Single females	ω_a^s	h_a	χ_s^f	ω_n^s	h_n	χ_s^f
Married females	ω_a^u	h_a	$\chi_{u,a}^f$	ω_n^u	h_n	$\chi_{u,n}^f$
Married males	ω_a^u	1	χ_u^m	ω_n^u	1	χ_u^m

- ω differs by location and marital status.
- χ differs by gender and marital status. Also by location for married females.
- h differs by location.

Calibration: results

Household type	Agriculture			Non-Agriculture		
	ω	h	χ	ω	h	χ
Single males	0.26	1	0.086	0.45	1	0.086
Single females	0.26	0.53	0.083	0.45	0.35	0.083
Married females	0.1	0.53	0.27	0.3	0.35	0.11
Married males	0.1	1	0.18	0.3	1	0.18

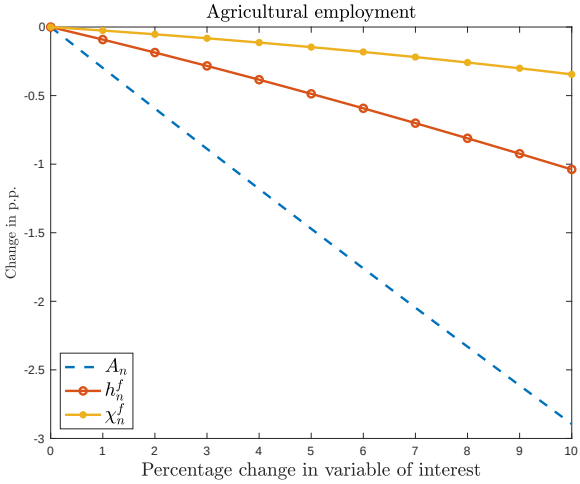
- Large labor market wedge in non-agriculture relative to agriculture.
- Higher share of home goods in non-agriculture/urban areas.
- Larger disutility of work in agriculture for married females.

Counterfactual

Effect on agricultural employment share and GDP of

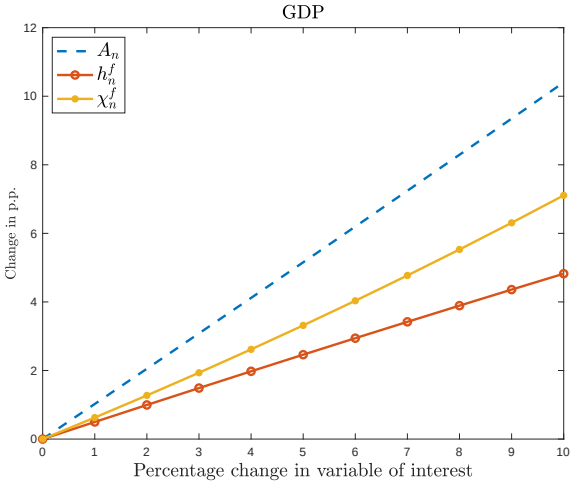
1. Change in non-ag TFP (A_n)
2. Change in h_h
3. Change in χ_n^f

Counterfactual



- Elasticity of ag. emp wrt norms (labor market penalty) = 1/7 (1/3) of non-ag TFP.

Counterfactual



- Elasticity of GDP wrt norms (labor market penalty) = 2/3 (1/4) of non-ag TFP.

Conclusion:

- Structural change out of agriculture is gendered.

> Gender wage gaps and disutility of female work in urban areas acts as a mobility cost for singles.

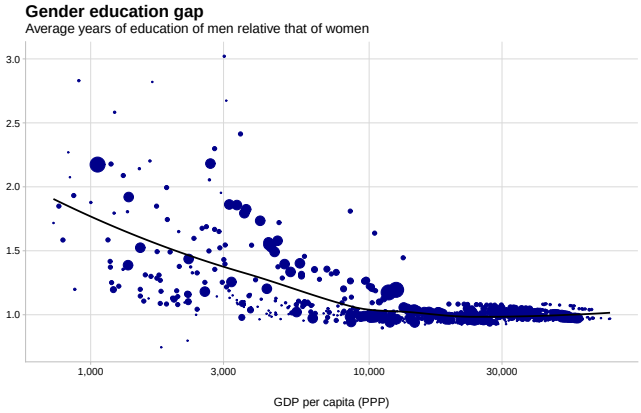
> Loss of spousal labor income in urban areas acts as a mobility cost for married households.

- These gender differences act as a break to structural change.

- Next steps:

  1. Time use survey data to improve model calibration.
  2. Discipline income effects by gender, marital status and location.

Appendix: Gender education gap



LOESS – Each country with weight 1, shaded area marks the 95% confidence interval
Age 15–64

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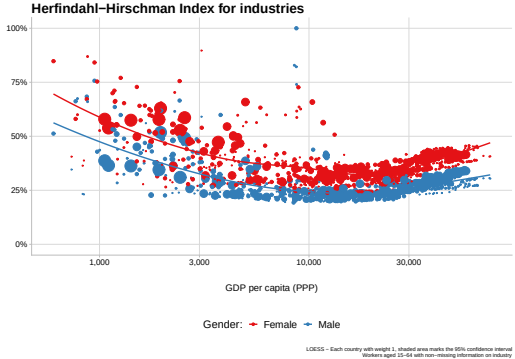
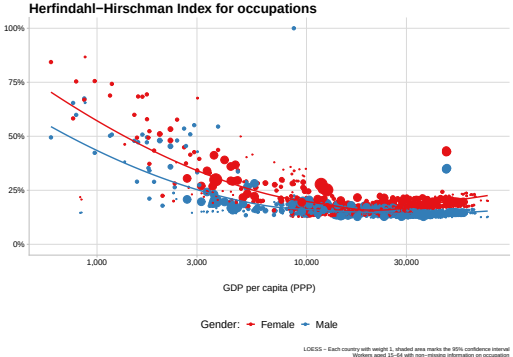
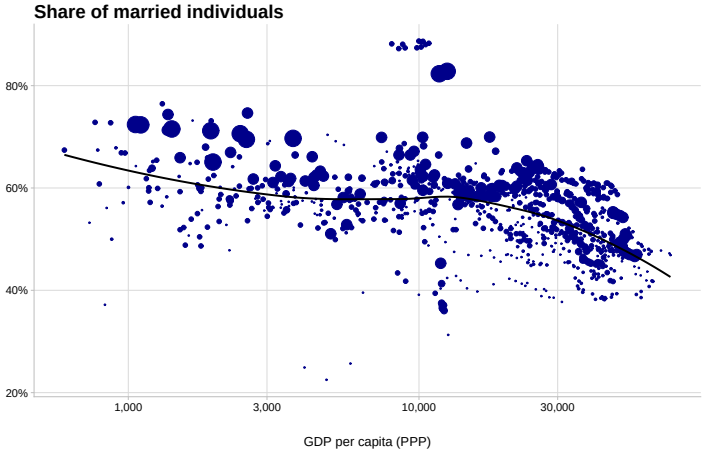
Appendix: Herfindahl Index





Female employment is concentrated than male employment, in particular in LIC. Back

Appendix: Marriage rate



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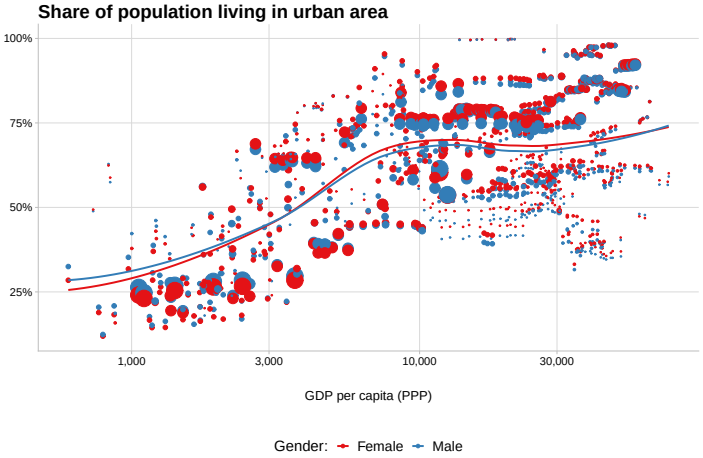
Appendix: Urbanization rate



LOESS – Each country with weight 1, shaded area marks the 95% confidence interval
Share of population aged 15–64

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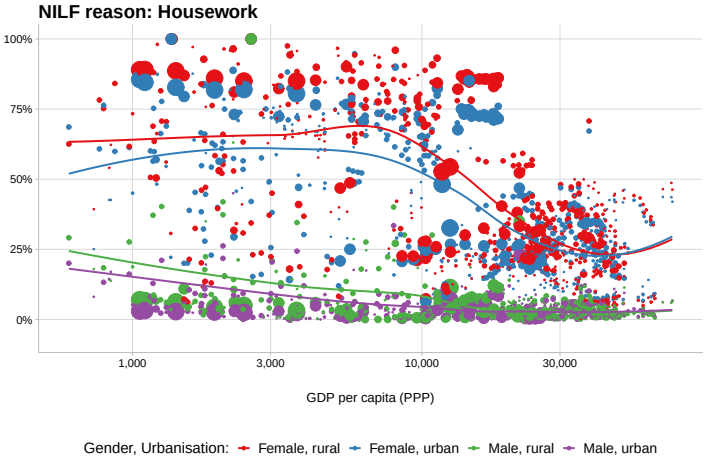
Appendix: Reason NILF by gender and urban



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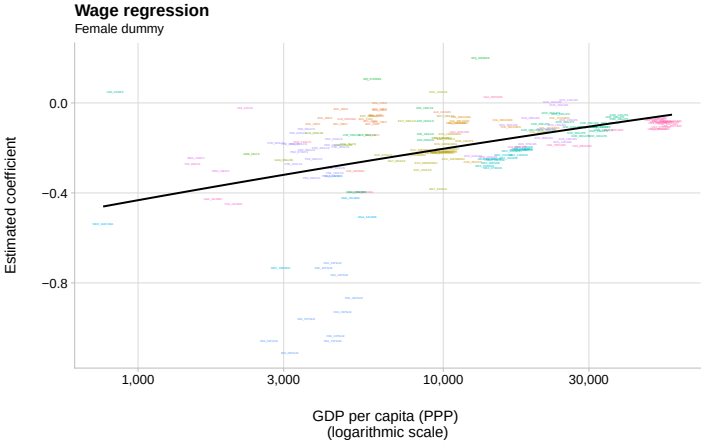
Mincer regression : Gender wage gap



Quadratic fit, shaded area marks the 95% confidence interval
Wage workers aged 15−64, nationally representative surveys, Min. sample size: 2'000, controls: age, age^2, quadratic fit.

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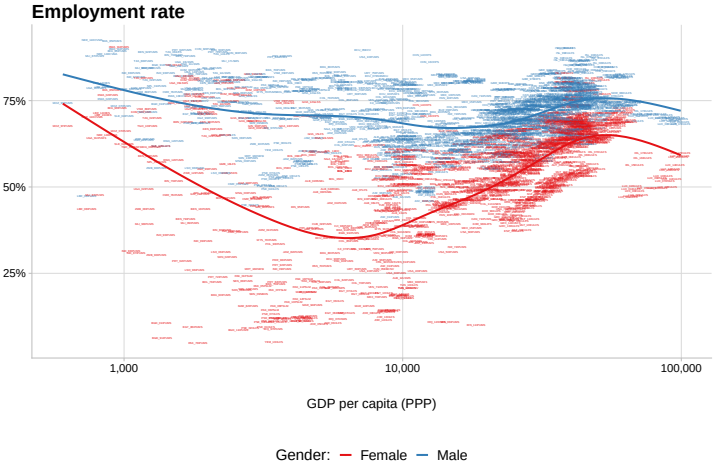
Employment rate by gender



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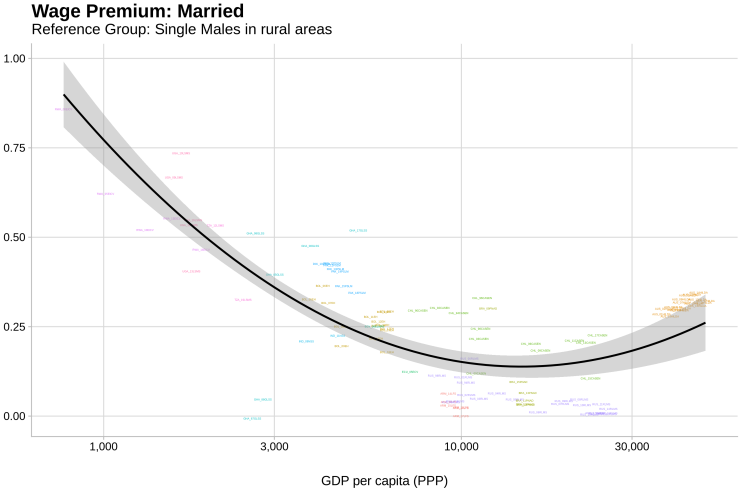
Marriage premium



Quadratic fit - Each country with weight 1, shaded area marks the 95% confidence interval
Working age population (Age 15-65), Outcome: Log hourly wage in the main job, excluding in-kind payments

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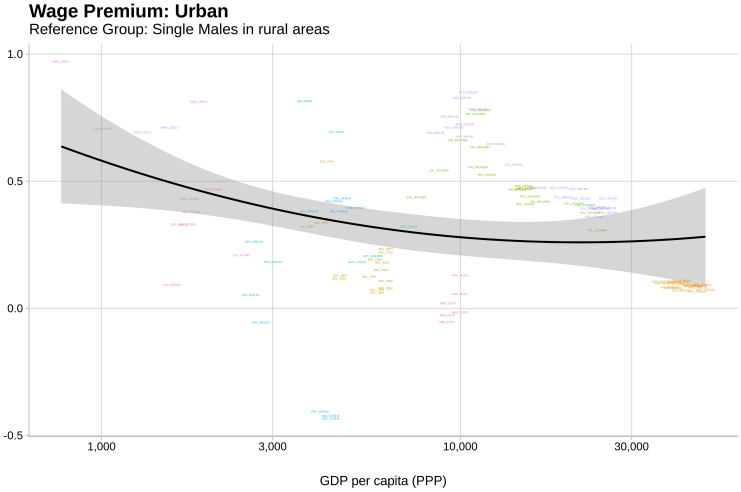
Urban premium



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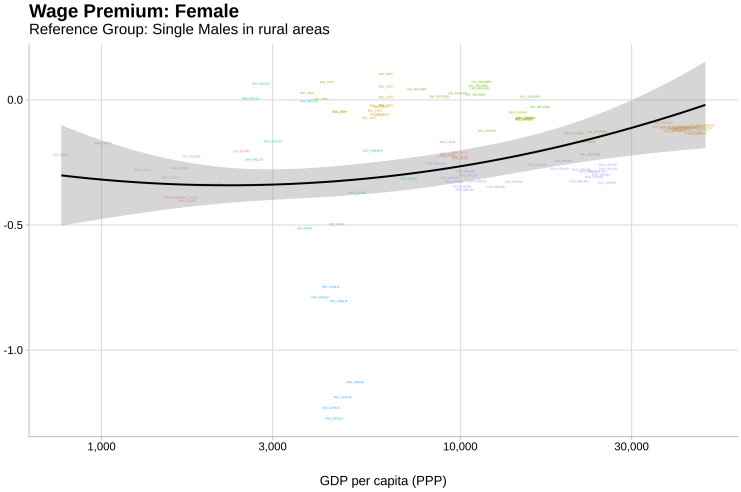
Gender wage gap



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Working age population (Age 15-65), Outcome: Log hourly wage in the main job, excluding in-kind payments

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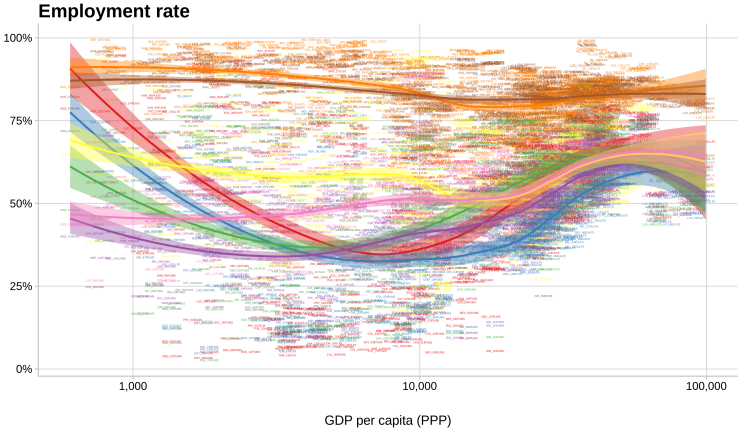
Employment rates by gender x marital status x urban



, Urbanisation, Marital status: Female, rural, married · Female, rural, single · Female, urban, married · Female, urban, single · Male, rural, married · Male, rural, single · Male, urbar · Male, urbar

LOESS - Each country with weight 1, shaded area marks the 95% confidence interval
Age 15-64

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