Gender-biased Structural and Technological Changes
(and The Political Economy of)

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Gendering Macroeconomics
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1 Structural change (SC)

- Employment transitions from agriculture to manufacturing and services, at the heart of a dynamic process of economic development (Ocampo, 2020)
- Canonical process primarily driven by men: women first transition out of agriculture and exit (paid) work, then re-enter labor force in (mostly) service sector (Braunstein and Zuazu, 2023; Chiplunkar and Kleineberg, 2025)

2 Technological change (TC)

- Shifts of the frontier between tasks performed by humans and machines
- SC and TC complex processes (economic development, secularization, education attainment, urbanization, fertility) embedded in gender systems
- Gender-neutral analysis of SC and TC no longer the default: gender gaps not only a social issue but a macroeconomic one

3 Political consequences of SC and TC

- Liberal democracies challenged by job-displacing effects of technological and structural changes and rise of radical/far right (Anelli et al., 2019; Kurer, 2020, Gallego and Kurer, 2022)
- Labor market outcomes affect political attitudes differently by gender (Gingrich and Kuo, 2022; Ikkaracan and Zuazu, 2025)

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Outline

Structural change and gender sectoral segregation in sub-Saharan African countries

- SC in SSA widely analyzed: premature deindustrialization and structural heterogeneity McMillan et al. (2017); Tregenna (2015); Rodrik (2016)

- SC's labor market outcomes in SSA are far less understood (Mensah et al., 2023), let alone its gender effects

- SC linked to distribution of paid/unpaid work already by Kuznets, Lewis and Boserup, gendered aftermath of structural adjustment programs covered by feminist macroeconomists (Benería and Feldman, 1992; Elson, 1995)

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- Formal and informal employment (Juhn et al., 2013, 2014; Arora et al., 2023)

- Gender sectoral segregation relatively low in SSA, while FLFP persistently low (Borrowman and Klasen, 2020)

- Non-linear association between aggregate labor productivity and gender segregation?

- IV panel data model (FLFP instrumented using household composition (Agarwal, 1997; Spierings, 2014; Dhanaraj and Mahambare, 2019))

$$log(ID_{ct}) = \beta_0 + \beta_1 LP_{c,t-s} + \beta_2 LP_{c,t-s}^2 + X'_{c,t-s}\beta + v_{ict} \qquad (1)$$

- Outcome variable: Dissimilarity index (Duncan and Duncan, 1955)

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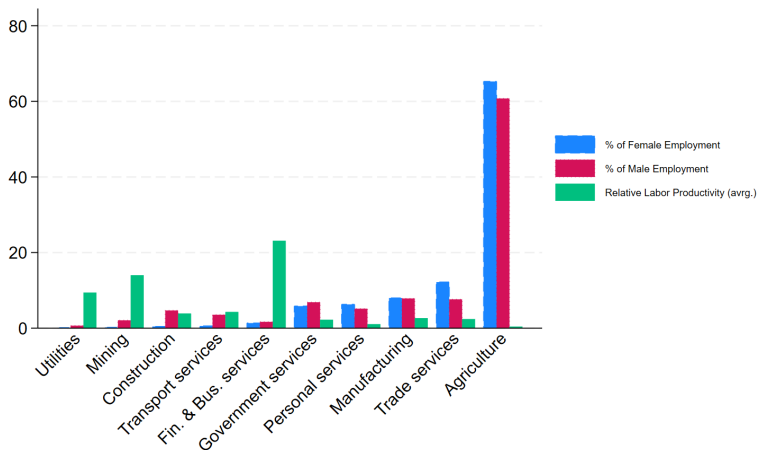
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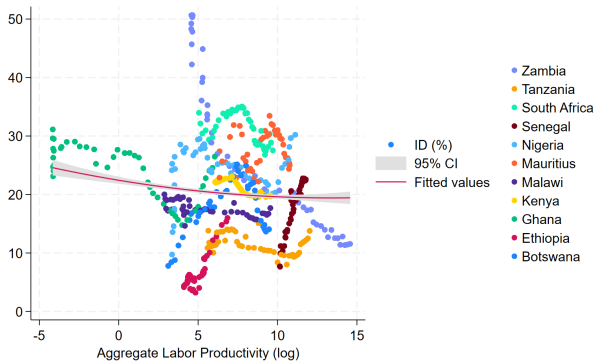$$log(ID_{ct}) = \beta_0 + \beta_1 LP_{c,t-s} + \beta_2 LP_{c,t-s}^2 + X_{c,t-s}'\beta + v_{ict} \qquad (1)$$

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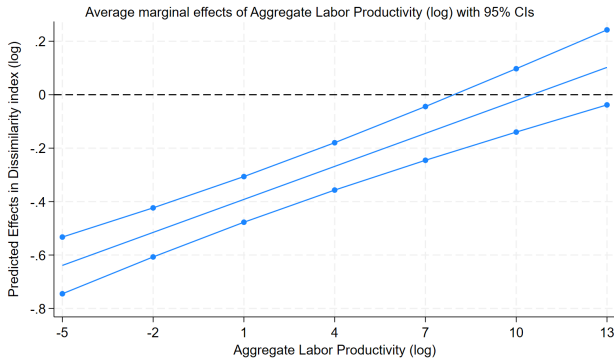$$ID = \frac{1}{2}\sum_{i=1}^{n}|\frac{F_i}{F} - \frac{M_i}{M}| * 100 \qquad (2)$$

Figure: Gender Distribution of Sectoral Employment and Relative Labor Productivity (Sample avrg. 1960-2010)

Figure: Aggregate Labor Productivity and Dissimilarity Index

Results

Average marginal effects of Aggregate Labor Productivity (log) with 95% CIs

Figure: Estimated Marginal Effects of Aggregate Labor Productivity in Gender Sectoral Segregation

Takeaway I

- Significant role of SC (proxied by aggregate labor productivity gains) in gender sectoral segregation in SSA, using IV and higher industry-level data disaggregation, supplementing previous knowledge Borrowman and Klasen (2020)

- Gender-sensitive variables and empirical analysis (e.g. household composition and size) to disentangle the reproduction and production sides of structural change, as suggested by Elson (2025)

- Non-linearities: initial increases of productivity lead to more equal distribution of sectoral employment, but further productivity gains might unleash gender competition for specific sectors

- SC as a *dynamic process* (Ocampo, 2020; Ciarli et al., 2021; Savona and Vertova, 2025) : *á la* Pasinetti on that economic development not a static but rather a *dynamic* process driven by continuous structural changes such as composition of output, factor endowments, and technological progress.

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Zuazu (2026) forthcoming *Fem. Econ.*

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- Gender consequences of robotization remain underexplored and evidence is inconclusive (Aksoy et al., 2021; Filippi et al., 2023), generally focus on aggregate levels, case studies and/or gender wage gap (Ge and Zhou, 2020; Deng et al., 2023)

- In this paper: whether and how industrial robots associate with share of women in manufacturing industries

  1. Employment effects of robotization: job-displacing effects of industrial robots −− > automation *vs* augmentation (Dauth et al., 2017; Acemoglu and Restrepo, 2020, 2022)

  2. De-feminization of the manufacturing: technological upgrading and labor productivity gains associated with reducing impact of women in industrial jobs (Seguino and Braunstein, 2019; Tejani and Kucera, 2021)

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Data and method

- Panel dataset of 11 manufacturing industries, 14 countries during 1993-2015
  UNIDO INDSTAT, International Federation of Robotics (IFR), COMTRADE, World Bank, ILO, Women in Business and the Law (WBL) – Eurostat RAMON correspondence

- Sample of countries Bulgaria, Croatia, India, Indonesia, Japan, Kuwait, Lithuania, Malaysia, Malta, Mexico, Morocco, Philippines, Türkiye and Vietnam

- Interactive dynamic panel data model, endogenous robotization and FLFP

$$y_{ict} = \beta_0 + \alpha y_{ic,t-1} + \beta_1 R_{ic,t-1} + \beta_2 FLFP_{c,t-1} +$$
$$+ \beta_3 R * FLFP_{ic,t-1} + X'_{ic,t-1} + Z'_{c,t-1}\beta + v_{ict} \quad (3)$$
$$i = industry; c = country; t = year;$$

- Bartik-shock type measure of Robotization (Bartik, 1991; Acemoglu and Restrepo, 2020; Bellemare and Wichman, 2020; Aksoy et al., 2021)

$$R_{ict} = IHS[\frac{Robots_{ict}}{Employees_{ic,1980}/10,000} - \frac{Robots_{ic,t-1}}{Employees_{ic,1980}/10,000}] \quad (4)$$

Descriptives I
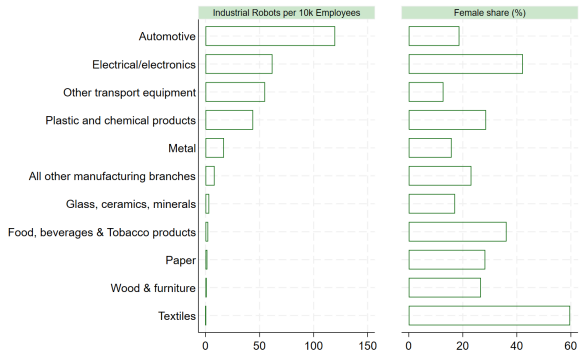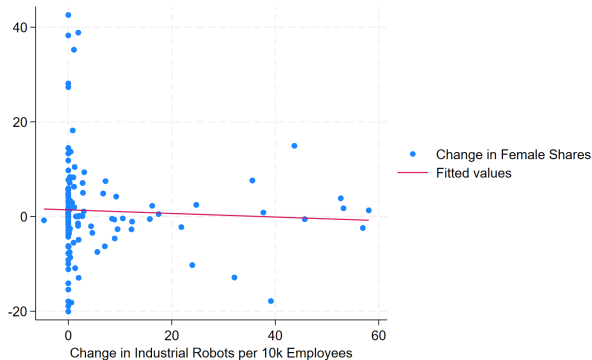

Figure: Robots per 10k Employees and Female Share of Manufacturing Industries

Descriptives II

Figure: Long-differences Correlation between Changes in Robots per 10k Employees and Female Shares

Results

Table 2: Robotization and FLFP in Female Shares in Manufacturing Industries

Dependent variable: Industry female share					
	(1)	(2)	(3)	(4)	(5)
	FE	Δ-GMM	Δ-GMM	Δ-GMM	Δ-GMM
Sample	All	All	All	No Japan	All
Female share$_{t-1}$	0.734***	0.340**	0.382**	0.371**	0.303**
	(0.066)	(0.165)	(0.143)	(0.148)	(0.141)
Robotization	2.374***	4.251**	3.116**	4.295**	4.397**
	(0.662)	(1.996)	(1.295)	(2.042)	(1.856)
FLFP	0.002***	-0.007	-0.000	0.002	0.002***
	(0.000)	(0.006)	(0.002)	(0.003)	(0.001)
Robotization * FLFP	-0.033***	-0.063**	-0.042**	-0.067*	-0.062**
	(0.011)	(0.030)	(0.019)	(0.036)	(0.028)
Elasticity of Robotization coefficient	0.028	0.003	0.004	0.004	0.006
Elasticity of Interaction coefficient	-0.0004	-0.0007	-0.0005	-0.0007	-0.0007
No. of Observations	1030	850	850	724	850
No. of Groups	90	90	90	81	90
Within R-squared	0.531				
Robotization treated as		Exogenous	Endogenous	Endogenous	Endogenous
FLFP treated as		Exogenous	Exogenous	Exogenous	Endogenous
AR(1)		0.003	0.001	0.001	0.001
AR(2)		0.496	0.486	0.449	0.638
Diff-hansen		0.119	0.688	0.208	0.987
No. of Instruments		24	58	58	58

Results
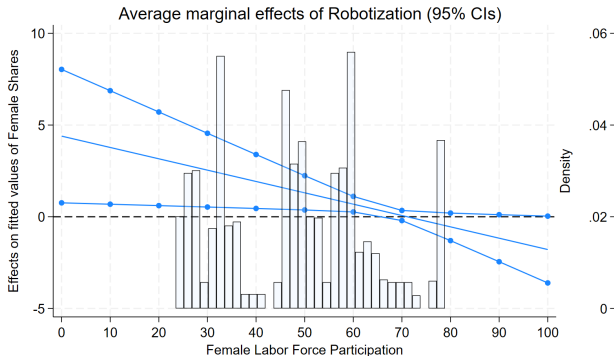
Figure: Interaction between Robotization and FLFP in Female Shares in Manufacturing Industries

Takeaways II

- Robotization seems to affect positively the share of women in manufacturing countries in the sample of countries considered

- Using levels of female employment and male employment, results suggest that robotization affects particularly women

- These results align and expand those of Deng et al. (2023) in finding that robots might increase female employment shares in manufacturing

- Context matters: the impact of robotization might depend on the attachment of women to the (paid) workforce

- Other relevant factors in the paper: country income levels and sectoral productivity levels

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How Gender Intersects with Paid and Unpaid Work Status in Political Ideology: Evidence from Homemakers in Spain

Ilkkaracan and Zuazu (2025) *Fem. Econ*

- Job-displacing effects of technological change and structural change can affect political attitudes (Kurer, 2020; Gallego and Kurer, 2022), gender differential impacts understudied (Gingrich and Kuo, 2022)

- Gender gaps in political ideology (Likert-type 1-10 scale) transformed from traditional (women more right-wing than) to modern gaps (women more left-wing) in most Western countries since 1980 (Inglehart and Norris, 2000, 2003; Shorrocks, 2018)

- Evidence for Italy and Türkiye show that right-wing/populist right political attitudes of women depend on their labor market attachment (Barisione, 2014; Ilkkaracan, 2019)

- In this paper: monthly survey individual data for Spain (1993-2019), we show that Spain adopted a modern gap model as of 2018, driven by women in the paid workforce

- Method: IV probit models using the probability of being left-wing as dependent variable

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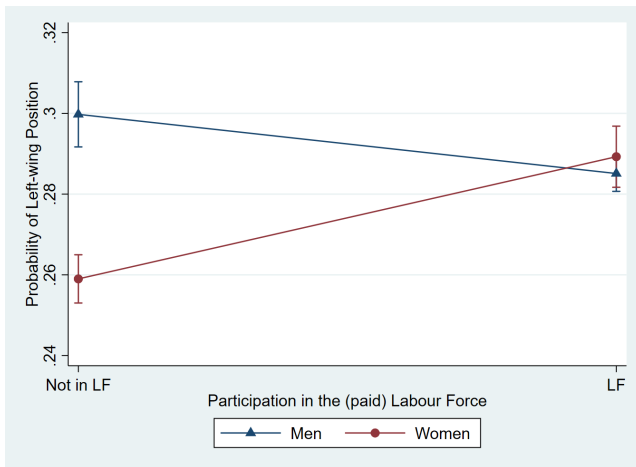Figure: Evolution of Political Ideology (1 leftist - 10 rightist) in Spain

Results

Figure: Predicted Probabilities (IV Probit Models)

Conclusions and final thoughts

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- Non-linearities, *dynamic* processes and contingencies: initial gains might get disrupted by increasing competition and new forms of discrimination

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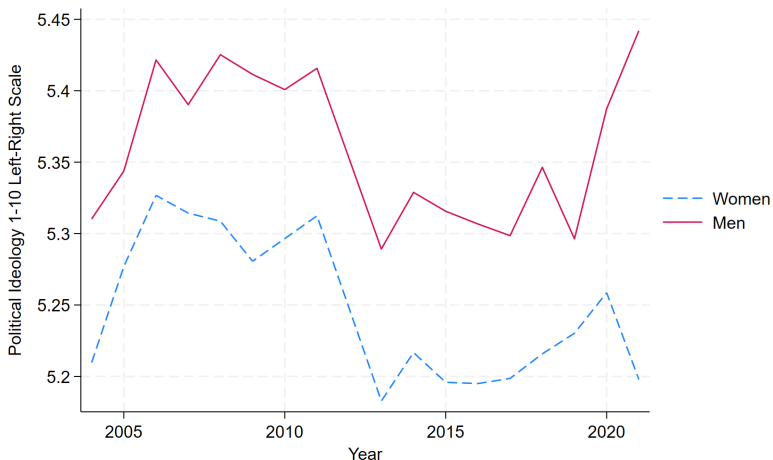
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Figure: Evolution of Political Ideology by Gender, EU28. Own elaboration. Data Source: Harmonized Euro barometer, GESIS.
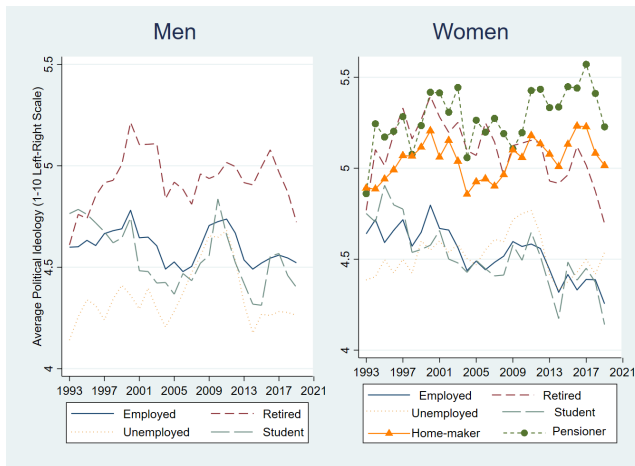
Descriptives II

Figure: Evolution of Political Ideology by Labor Market Status in Spain

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