

THE IMPACT OF TECHNOLOGY ON LABOUR MARKET OUTCOMES OF DEMOGRAPHIC GROUPS

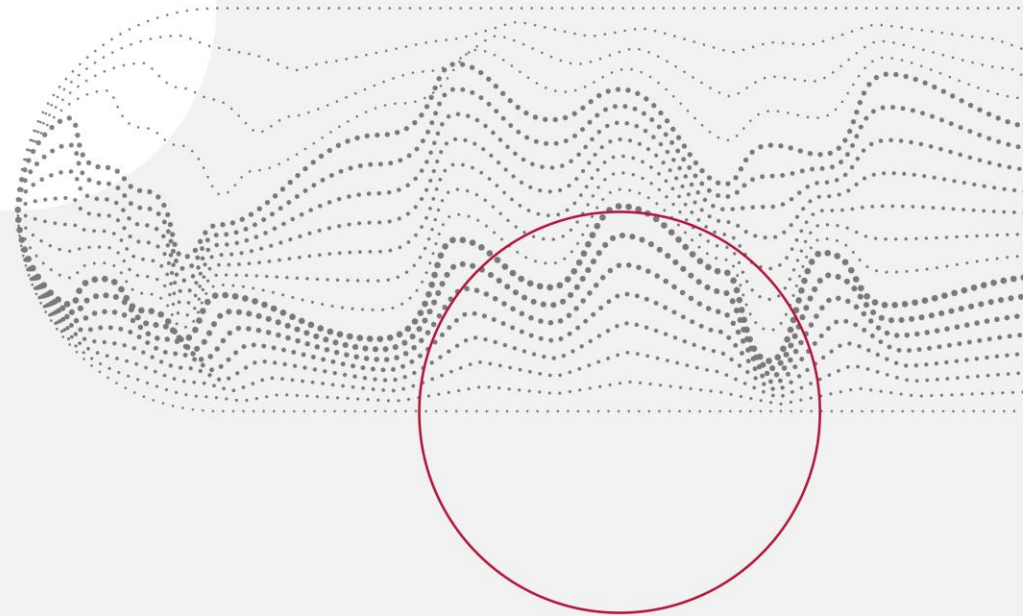
PRELIMINARY RESULTS

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Which demographic groups benefit from technological change?



- Technological progress has neutral or small positive effect on overall employment in Europe (Bachmann et al. 2022, Dauth et al 2021, Gregory et al. 2021, Klenert et al. 2020)
- But it induces job polarization (Salomons et al 2014, Fonseca et al. 2018, Jerbashian 2019)
- What is the demographic distribution of winners and losers?
- Are the effects of robots adoption similar to the effects of ICT capital?

Previous research on the impact of technology on demographic groups



Paper	Data	Outcome variables
Behaghel et al. (2014)	France, late 1990s	Wage bill shares, employment flows
Autor et al. (2015)	US, 1980-2007	Employment in occupation groups
Jerbashian (2019)	10 EU countries, 1993-2007	Demographic group employment shares
Lewandowski et al. (2020)	12 EU countries, 1998-2015	Age-group employment shares
Fillmore and Hall (2021)	Tennis players, 1968-2014	Players quality
Aksoy et al. (2021)	20 EU countries, 2006-2014	Gender pay gap

We study the age- and gender-specific labour market effects of exposure to technology



- Analyse both the effects of ICT capital growth and robots adoption
- Effects by gender and age (4 groups: 20-29, 30-49, 50-59, 60+)
- Key labour market outcomes:
 - Employment shares
 - Average hourly wage
 - Share in wage bill
- Focus on the post-2010 period – largely unexplored

Dataset based on the Structure of Earnings Survey



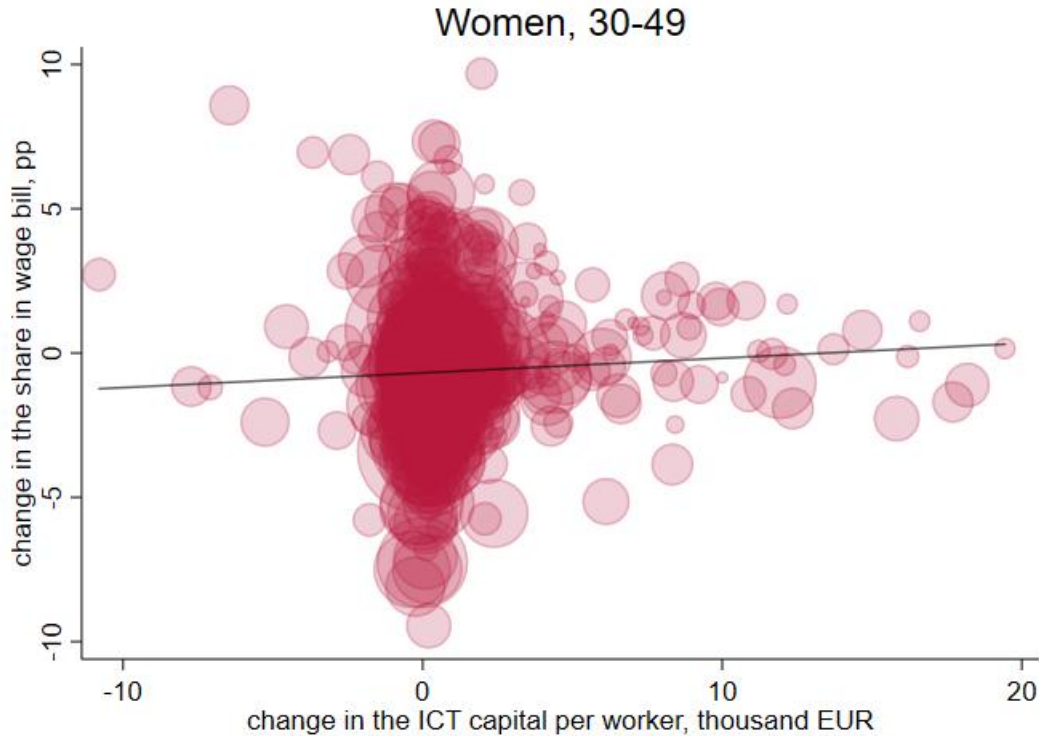
- Data on labour market outcomes derived from the EU-SES microdata
- ICT capital from Eurostat
- Robots adoption from International Federation of Robotics
- GVC participation from OECD TiVA

- Study period: 2010 – 2018, allows fine matching of SES with ICT capital data
- 14 countries, 22 sectors per country
- Unit of observation: demographic group in a country-sector-year cell
 - on average, over 2,900 obs.

Weak positive correlation between technology adoption and labour market outcomes of prime-aged women



growth of ICT capital vs change of share in wage bill



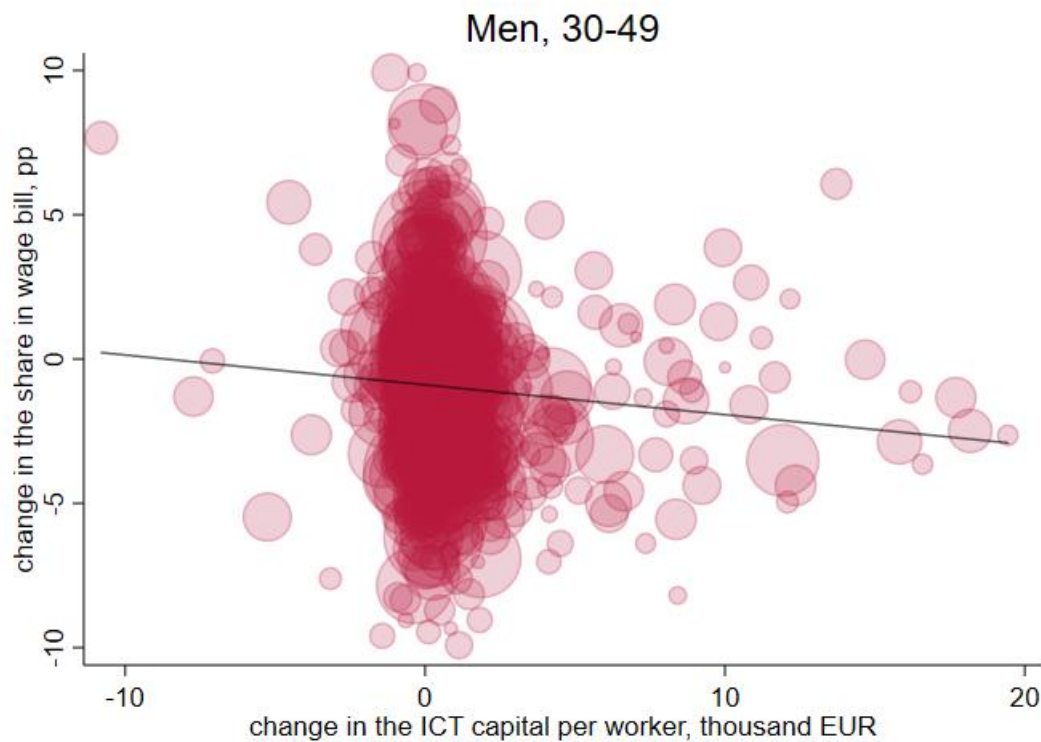
increase in robots exposure vs change of share in wage bill



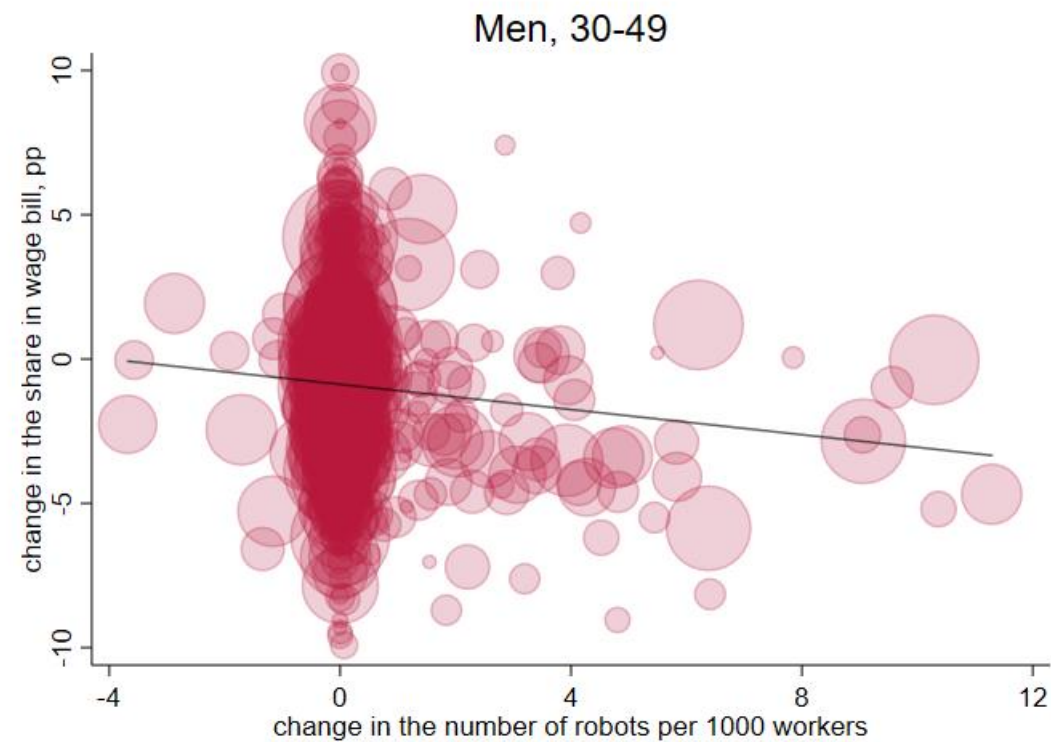
Negative correlation between technology adoption and labour market outcomes of prime-aged men



growth of ICT capital vs change of share in wage bill



increase in robots exposure vs change of share in wage bill



Identification strategy relies on the variation of technology adoption between sectors . | :

For each demographic group, and each outcome variable we estimate the following model:

$$\Delta y_{c,s,d,t} = \beta_1 \Delta I_{c,s,t} + \beta_2 \Delta R_{c,s,t} + \beta_3 \Delta GVC_{c,s,t} + \beta_4 Edu_{c,s,d,t-1} + \rho_{c,t} + \epsilon_{c,s,d,t}$$

$\Delta I_{c,s,t}$ and $\Delta R_{c,s,t}$ are four-year changes in, respectively, ICT and robots exposure;

c – country, s – sector, d – demographic group, t – time period

We control for:

- changes in participation in global value chains
- lagged share of tertiary educated persons relative to the sector's average
- country-year fixed effects

We focus on 2SLS estimations to obtain causal effects



- For each technology variable, we use „technology frontier” instrument, following Acemoglu and Restrepo (2019), Dauth et al. (2021), Bachmann et al. (2022)
- Exposure to technology is instrumented with the average exposure in the same sector in other European countries
- Instruments are relevant:
 - First-stage F-statistic for $\Delta I_{c,s,t} \sim 12$
 - First-stage F-statistic for $\Delta R_{c,s,t} \sim 19$
 - Maximum size distortion of Wald test statistics < 10%

Positive employment effects for young and prime-aged women, negative for prime-aged men and older women



	Women	Men	Women	Men
	Age 20-29		Age 30-49	
Δ ICT capital	0.134** (0.066)	-0.004 (0.075)	0.189* (0.103)	-0.128 (0.119)
Δ Robots	0.256*** (0.086)	-0.12 (0.078)	0.096 (0.088)	-0.308** (0.154)
	Age 50-59		Age 60+	
Δ ICT capital	0.002 (0.064)	-0.092 (0.088)	-0.198*** (0.052)	0.080* (0.045)
Δ Robots	-0.037 (0.054)	0.157* (0.093)	-0.166** (0.072)	0.044 (0.041)

No significant effects for relative wages



	Women	Men	Women	Men
	Age 20-29		Age 30-49	
Δ ICT capital	0.188 (0.254)	-0.146 (0.194)	0.195 (0.201)	-0.225 (0.189)
Δ Robots	0.169 (0.228)	0.065 (0.226)	0.082 (0.195)	0.373* (0.199)
	Age 50-59		Age 60+	
Δ ICT capital	0.196 (0.160)	-0.362 (0.256)	0.358 (0.448)	0.486 (0.376)
Δ Robots	-0.115 (0.203)	-0.281 (0.268)	0.127 (0.511)	0.296 (0.490)

Shares in the wage bill: positive effects for young and prime-aged women, and for older men; negative effects for prime-aged men and older women

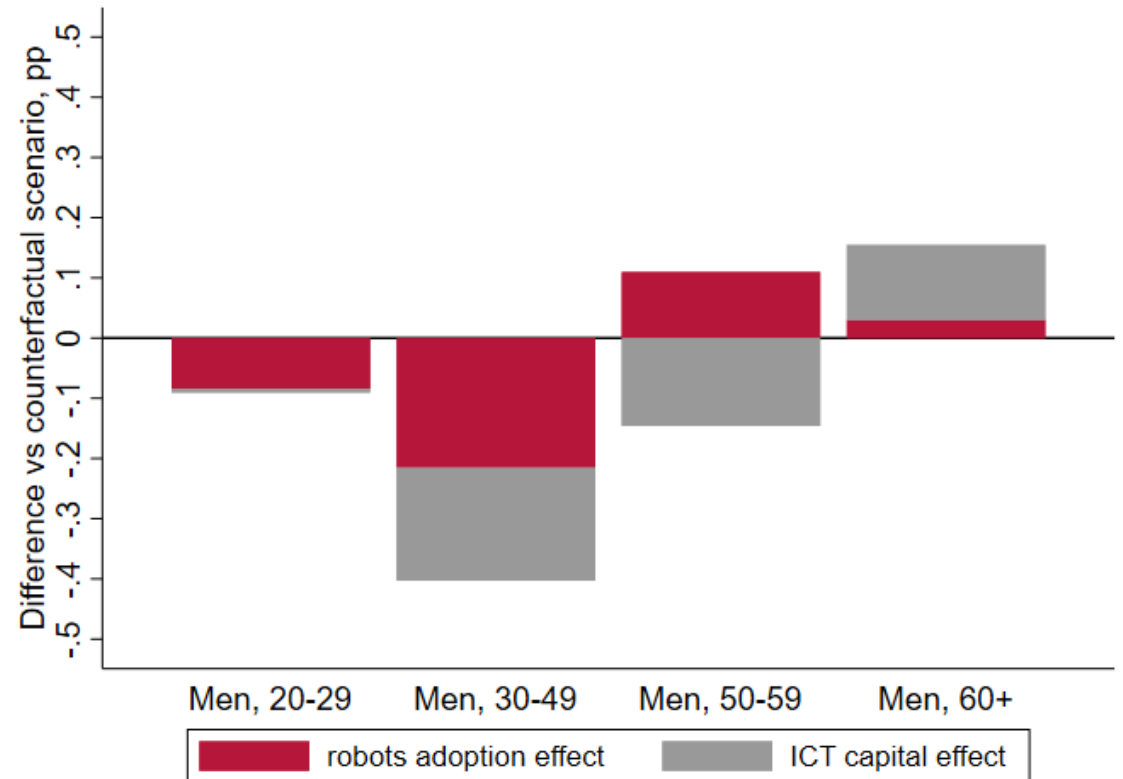
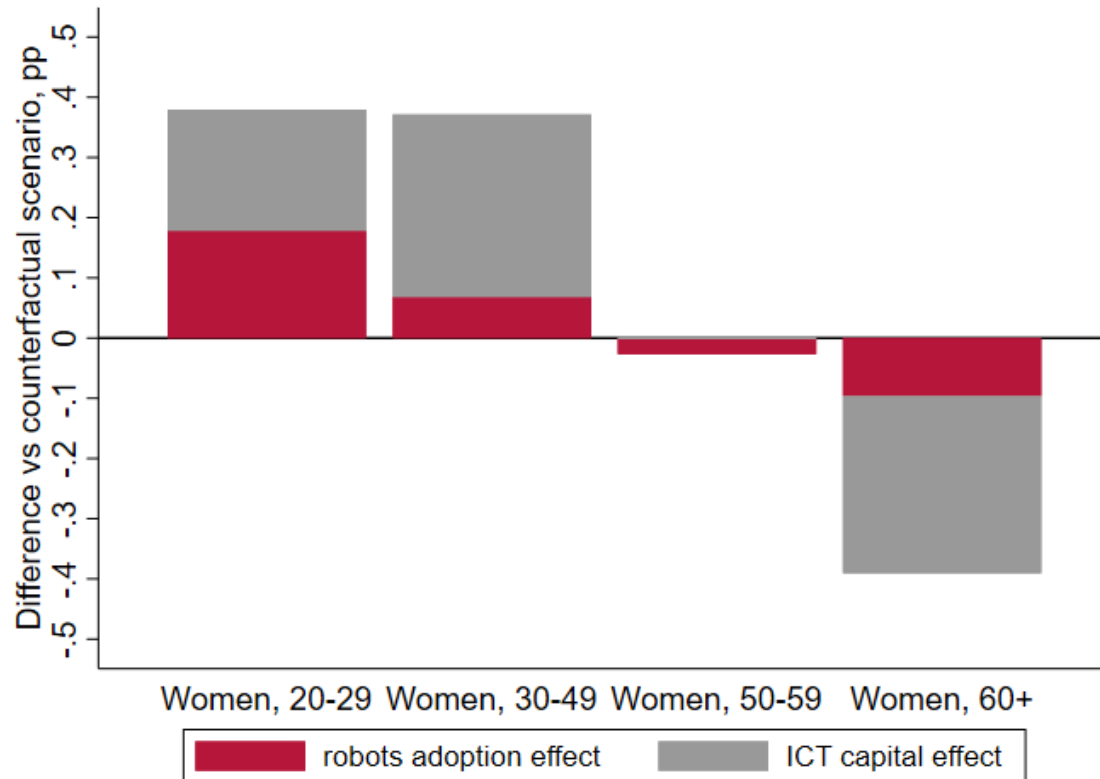


	Women	Men	Women	Men
	Age 20-29		Age 30-49	
Δ ICT capital	0.117** (0.054)	0.008 (0.062)	0.201** (0.102)	-0.165 (0.139)
Δ Robots	0.170*** (0.060)	-0.124 (0.075)	0.093 (0.085)	-0.218 (0.164)
	Age 50-59		Age 60+	
Δ ICT capital	0.035 (0.063)	-0.106 (0.108)	-0.172*** (0.047)	0.110** (0.049)
Δ Robots	-0.047 (0.056)	0.127 (0.099)	-0.153** (0.068)	0.059 (0.049)

We quantify positive employment effects for young and prime-aged women, and negative effects for older women and prime-aged men



Differences between historical and counterfactual (no technology growth in 2010 – 2018) employment shares



Conclusions and caveats



- Technology adoption improves relative labour market outcomes of young and prime-aged women
- Vulnerable groups include older women and prime-aged men
- Our results are relevant for demographic-specific challenges: youth unemployment, gender wage gap, increased longevity
- Our study is limited by the availability of the ICT capital data – better reporting to Eurostat would benefit evidence-based policy