

# Structural labour market change and fertility

Anna Matysiak



# Structural labour market change



AUTOMATION



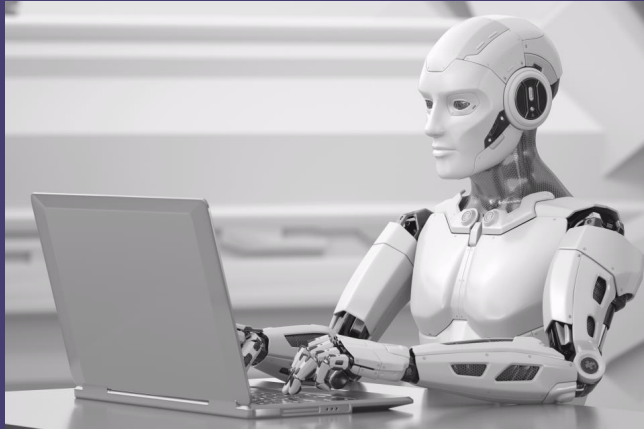
WORK AUTONOMY



WORK DEMANDS



# Structural labour market change



AUTOMATION



WORK AUTONOMY



WORK DEMANDS



# Automation

## Labour displacing effects

Certain job and work tasks get replaced by machines



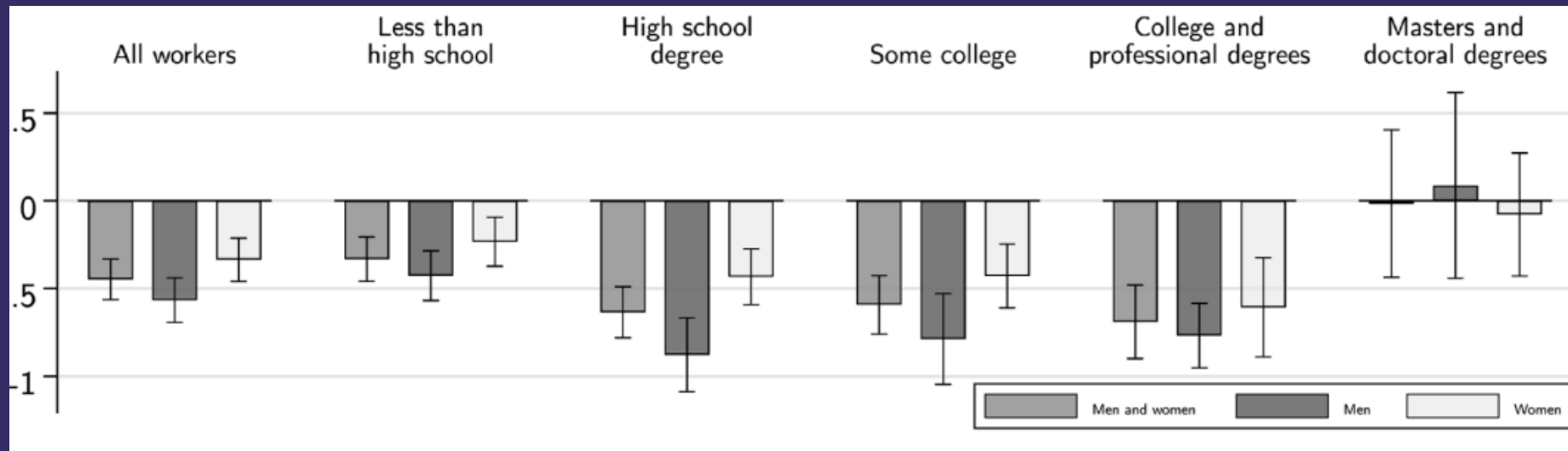
## Labour augmenting effects

Computers complementing human labour → higher productivity

Expansion of the service sector, new jobs

# Automation

- **US:** 1 robot / 1000 workers reduces the employment rate by 0.2 pp. and wages by about 0.42% (Acemoglu and Restrepo 2020)



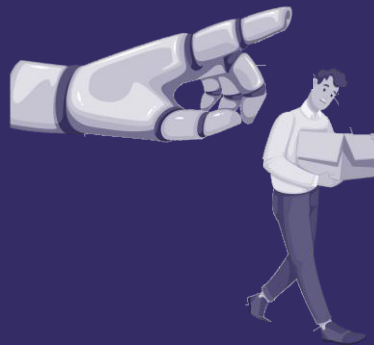
- **Europe:** null overall effect, but negative effects on employment of low and middle educated workers (Graetz and Michaels 2018)

# • Task content of occupations

- Abstract tasks (non-routine cognitive)
  - Analytical
  - Social
- Routine tasks (cognitive and manual)
- Non-routine manual tasks

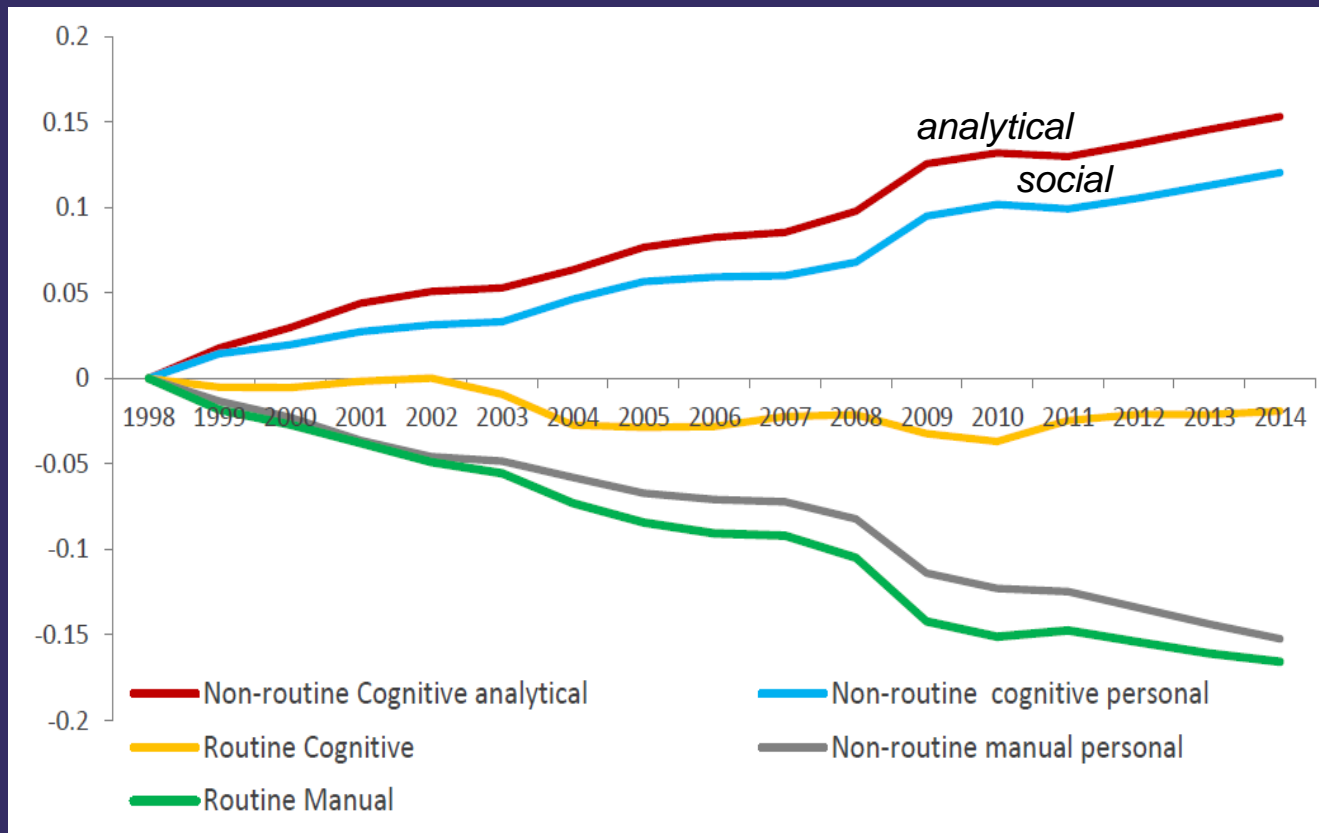
# • Task content of occupations

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# Changing demand for labour

Changing task content of jobs, EU 1998-2014



non-routine cognitive /  
abstract

routine cognitive

non-routine manual

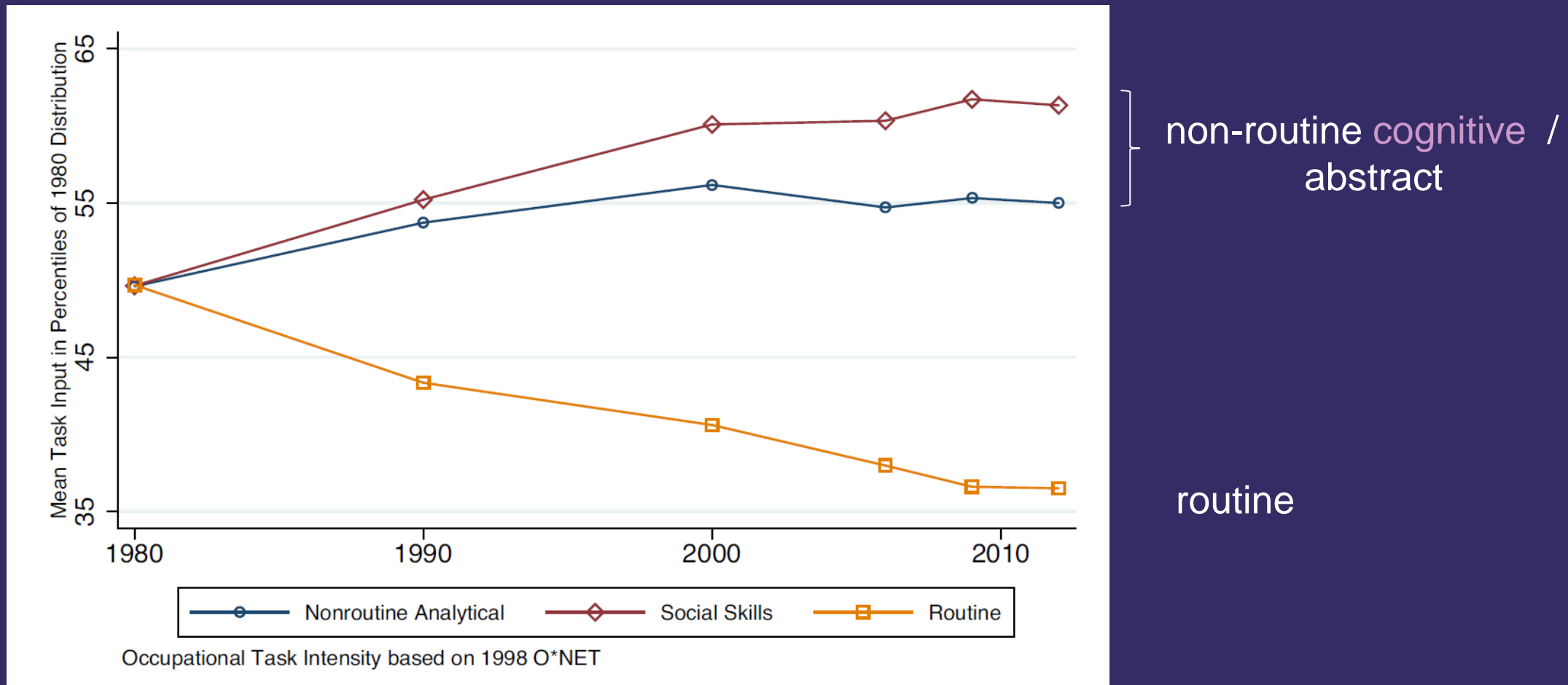
routine manual

Source: Górká et al. (2017)



# Changing demand for labour

Changing task content of jobs in the US



Source: Deming (2017)

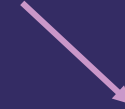
# LM consequences of automation

- changing demand for labour

abstract  
tasks



routine  
tasks



- growing disparities between high and low-to-middle skilled
  - employability
  - job quality

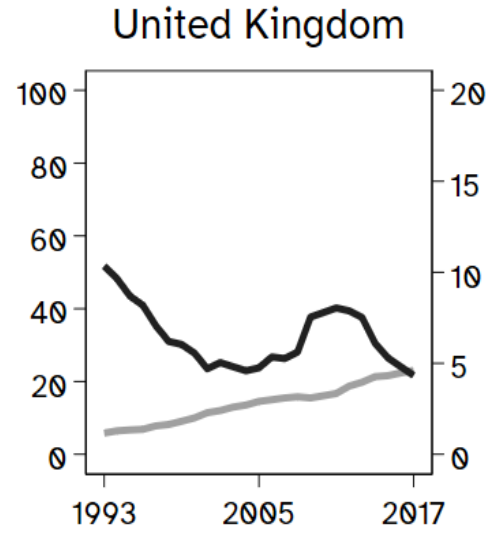
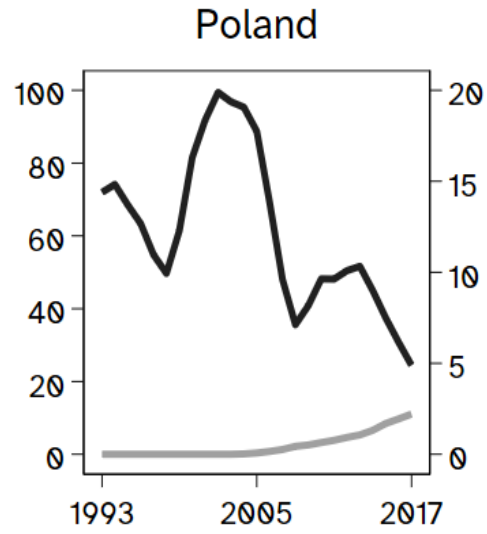
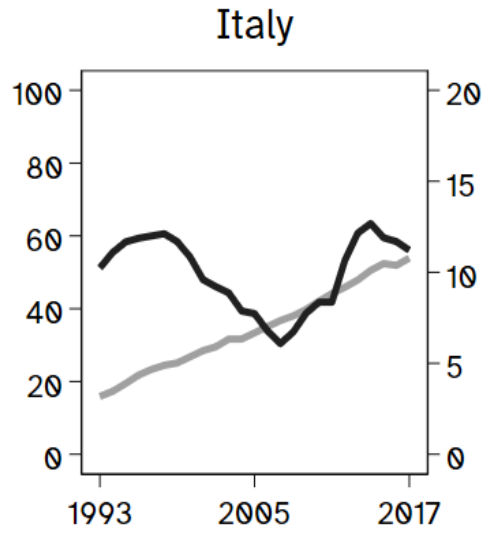
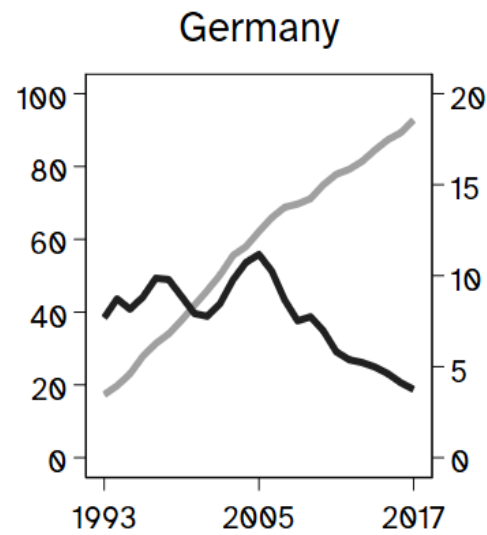
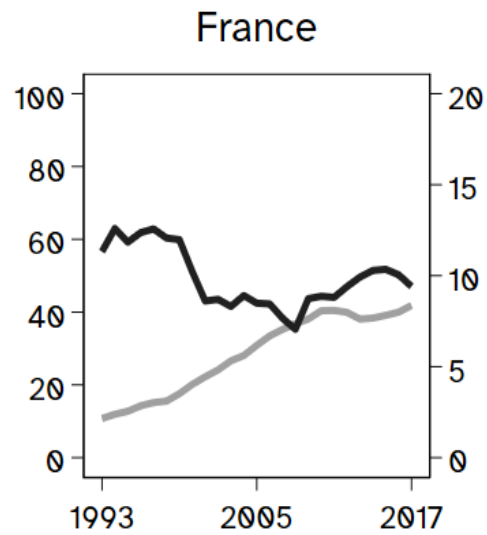
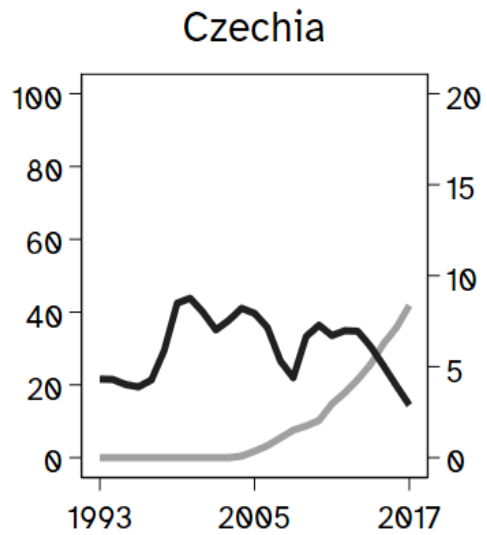
- turnover in the labour market
- uncertainty (Dekker et al. 2017, Schwabe and Castellacci 2020)
- negative effects on mental health (Abeliansky et al. 2019)
- even higher mortality (Gihleb et al. 2021, O'Brien et al. 2022)
- ongoing change (not cyclical)



# LM consequences of automation

- Unclear gender effects
- Women more present in routine jobs (Brussevich et al. 2019)
- But also leaving these jobs more quickly (Black and Spitz-Oener 2010, Cortes et al. 2021)
- No / slightly positive effects on overall employment of women relative to men (Cortes et al. 2021) but women seem to be losing in terms of pay (Aksoy et al. 2019, Matysiak et al. 2023)





— Robots per 10.000 Workers    — Unemployment Rate

# Fertility effects of automation



AUTOMATION



## MACRO-LEVEL STUDY

Co-authors: D. Bellani & H. Bogusz

Countries: DE, IT, FR, UK, PL & CZ

Period: 1993-2017

Data:

- NUTS-2 data on fertility & employment structures by industry (NACE 2-digit)
- IFR robot stocks (country- and industry-specific) at 3 digit since 1993

Measure:

- Exposure to automation



## MICRO-LEVEL STUDY 1

Co-authors: L. Andersson, W. Hardy

Countries: Sweden

Period: 1993-2017

Data:

- Swedish register data
- IFR robot stocks (industry-specific) at 3 digit since 1993

Measure:

- Exposure to automation



$$\text{Exposure to robots}_{r,t} = \frac{\text{robots}_{i,t}}{\text{empl}_{i,t_0}}$$

replacement of initial  
employment (at  $t_0$ ) in  
industry  $i$  by robots



**MICRO-LEVEL STUDY**



$$\textit{Exposure to robots}_{r,t} = \sum_{i=1}^N \left( \frac{\textit{empl}_{r,i,t_0}}{\textit{empl}_{r,t_0}} \right) \frac{\textit{robots}_{i,t}}{\textit{empl}_{i,t_0}}$$

distribution of initial  
employment at t0 across  
regions

**MACRO-LEVEL STUDY**



# MACRO-LEVEL STUDY

Model:

Fertility rates ~ exposure to automation + controls

Controls:

- population age structure
- % highly educated
- ratio highly educated women to men
- women's economic activity rate
- regional and year fixed effects



# MICRO-LEVEL STUDY 1

Method:

- Standard event history models
- Events:
  - 1st, 2nd, 3rd births
  - Marriage
  - Divorce

# Fertility effects of automation

Country	TFR	FR 20-24	FR 25-29	FR 30-34	FR 35-39	FR 40-44	FR 45+
Germany	ns	ns	ns	ns	-0.00011***	-0.00005***	ns
France	ns	ns	ns	ns	ns	ns	ns
Italy	-0.00118*	ns	-0.00090***	ns	ns	ns	ns
UK	ns	ns	ns	ns	ns	0.00039*	ns
Czechia & Poland	ns	ns	ns	ns	0.00025*	ns	ns

\*\*\* 1% \*\* 5% \* 10%. Sample sizes: 680 observations for Germany, 440 for France, 400 for Italy, 700 for the UK, and 240 for Poland and Czechia jointly.

Source: Matysiak, Bellani, Bogusz 2023

# Fertility effects of automation

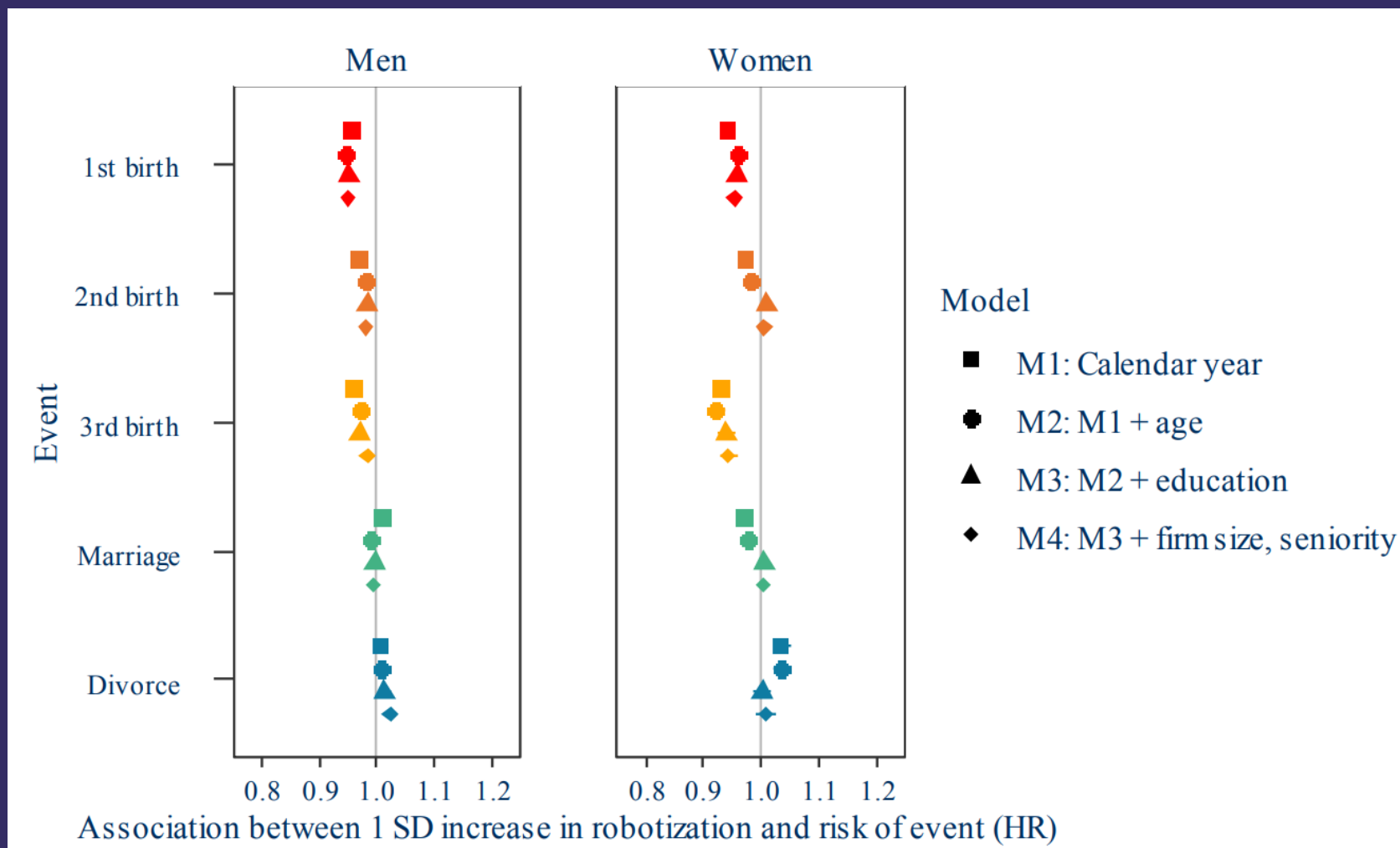
## # % highly educated

Country	TFR <i>main effect</i>	TFR <i>interaction effect</i>
Germany	-0.0016***	0.00005***
France	0.0015**	-0.00058**
Italy	-0.00292*	0.0001
UK	ns	ns
Czechia & Poland	ns	ns

\*\*\* 1% \*\* 5% \* 10%.

Source: Matysiak, Bellani, Bogusz 2023

# Fertility effects of automation, Sweden



Source: Andersson, Hardy, Matysiak, ongoing

## MICRO-LEVEL STUDY 2

Co-authors: E. Brini, T. Lappegard, L. van der Velde

Countries: Norway

Period: 1996-2017

Data:

- Norwegian register data

Measures:

- Measures of task content of occupations based on ESCO

Method:

- Standard event history models
- Events:
  - 1st, 2nd, 3rd births

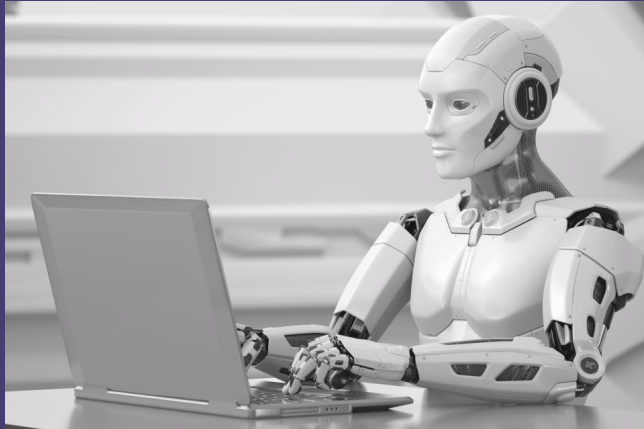


# Fertility effects of automation

	WOMEN				MEN		
	1st birth	2nd birth	3rd birth		1st birth	2nd birth	3rd birth
Manual	1.037***	0.979*	1.045*		1.120***	0.989	1.054***
Routine	0.993	0.995	0.995		0.911***	0.969***	1.010
Analytical	1.017**	1.037***	1.059***		0.998	1.020**	1.007
Social	1.155***	1.017**	1.078***		0.967***	0.979*	1.052**

Source: Brini, E., Lappegard, T., Matysiak, A., van der Velde, L., ongoing

# Structural labour market change



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WORK DEMANDS



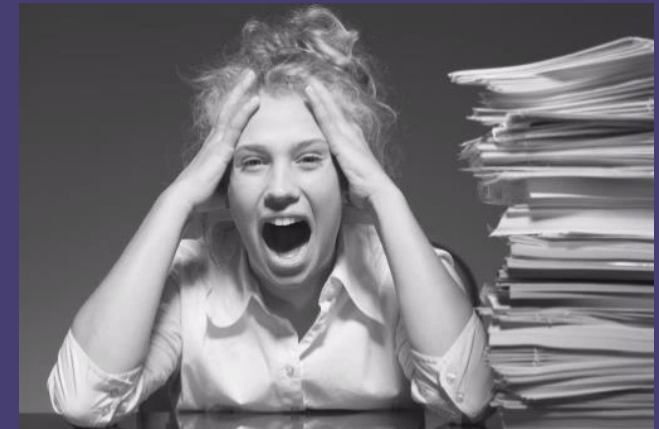
# Structural labour market change



AUTOMATION



WORK AUTONOMY



WORK DEMANDS





# Work autonomy



WHEN?



WHERE?



HOW?

# Work autonomy



WHEN?



WHERE?



HOW?

## PROS:

- Possibility to adjust paid work to family demands
- Time savings
- Larger presence in children's life
- Work-family balance

# Work autonomy



HOW?

## CONS:

- Spillover from family to work
- Fragmented working time & multitasking
- Expectations re housework / childcare
- Stress
- Flexibility stigma & negative career consequences

# Work autonomy



**WHEN?**

- Higher job satisfaction
- Higher responsibility for work outcomes
- Unlimited / unpredictable working time
- Longer working hours
- Job pressure
- Knowledge-intensive sectors



**WHERE?**



**HOW?**

# Work autonomy



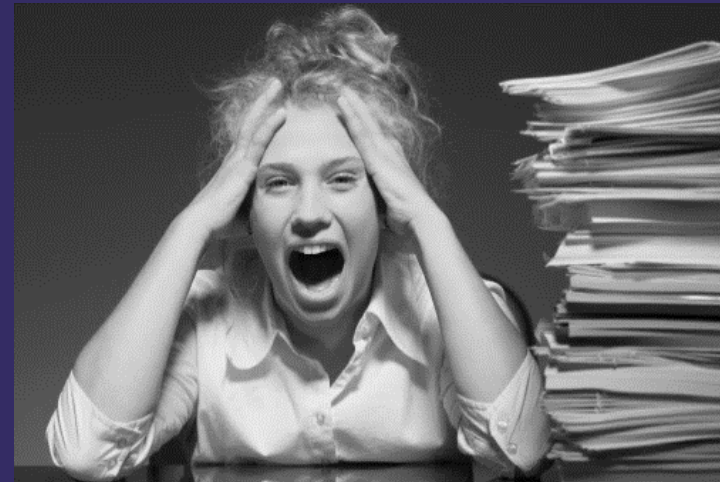
WHEN?



WHERE?



HOW?



# Work autonomy & fertility

**Data:** UKHLS 2009-2019

**Sample:**

partnered women aged 18-44



2,165



2,278



Control over start /  
end of working day



Regular / irregular  
work from home

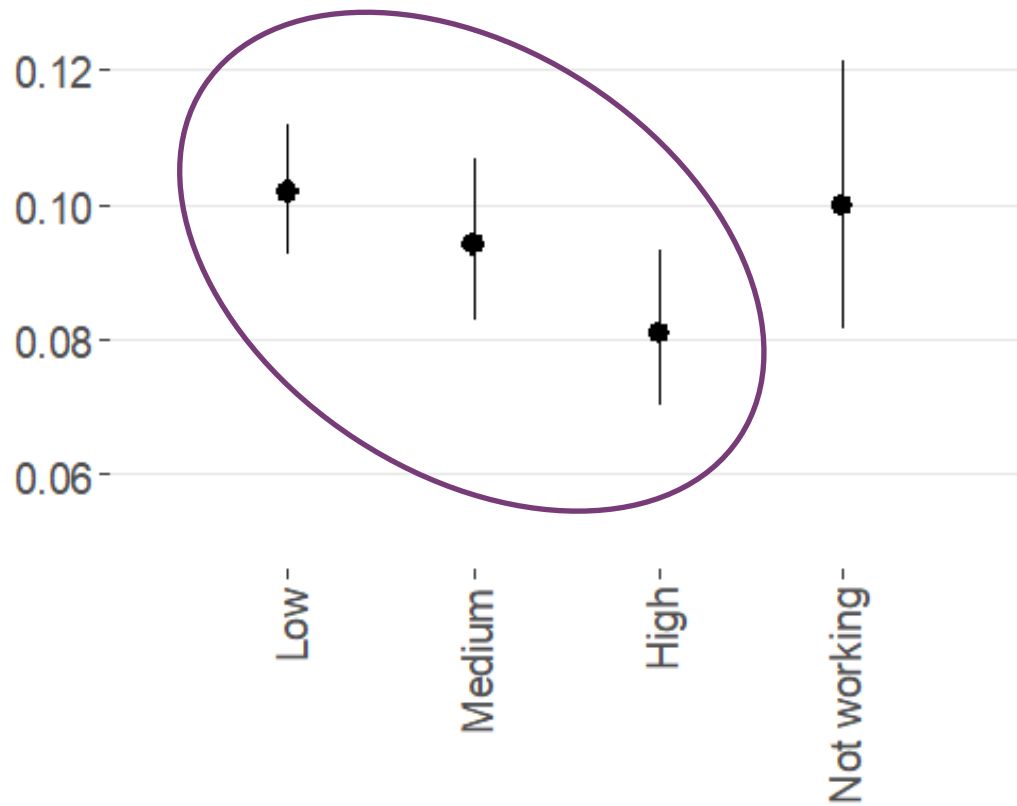


Control over (1) job tasks,  
(2) task order, (3) work  
pace, (4) work manner

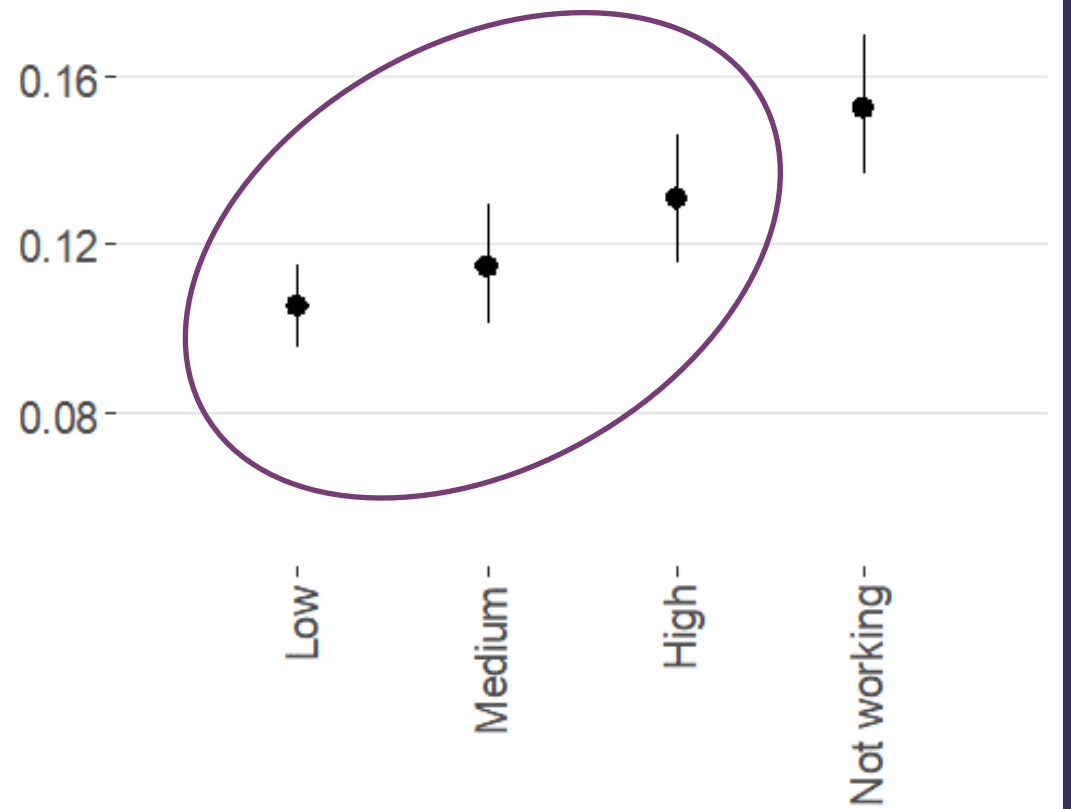
# WHEN?



## FIRST BIRTH



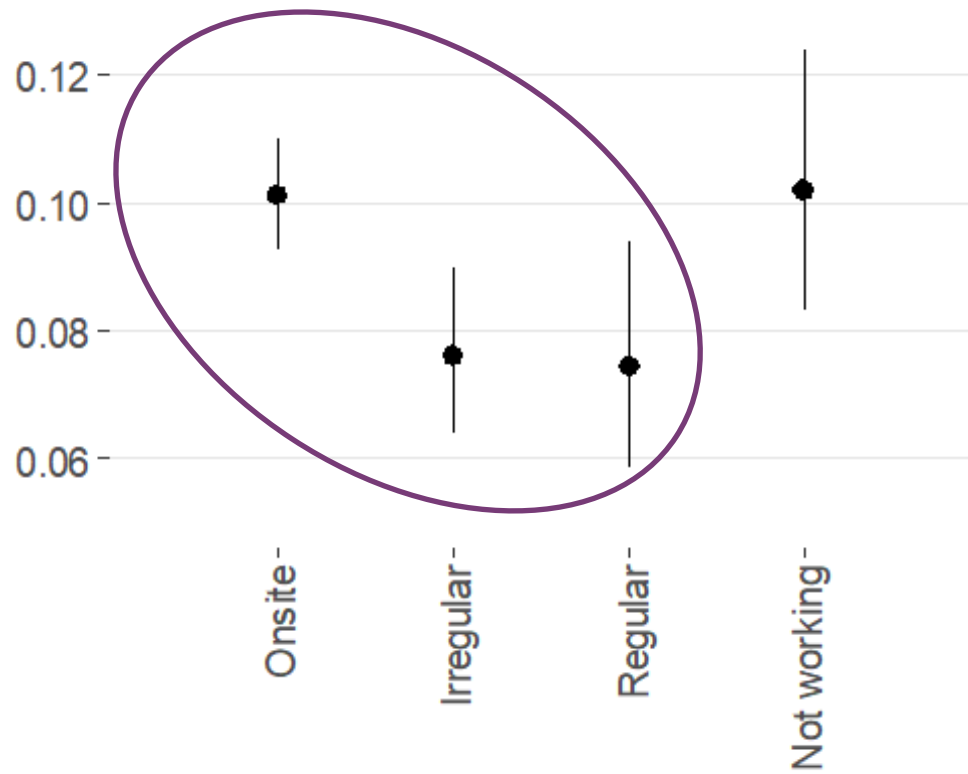
## SECOND BIRTH



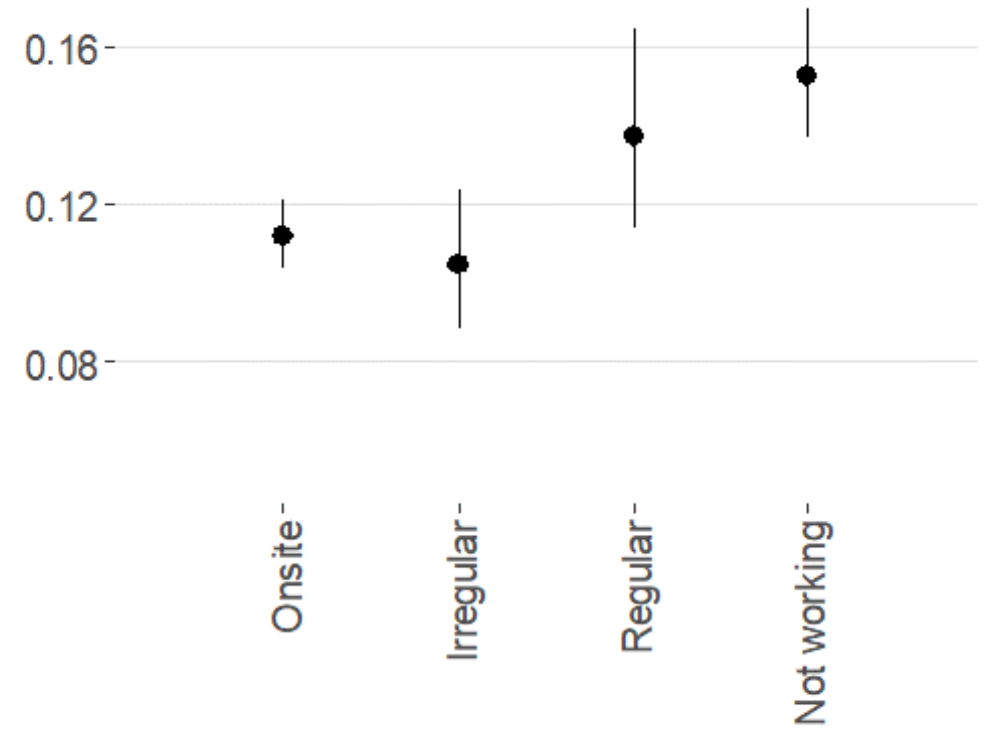
# WHERE?



## FIRST BIRTH

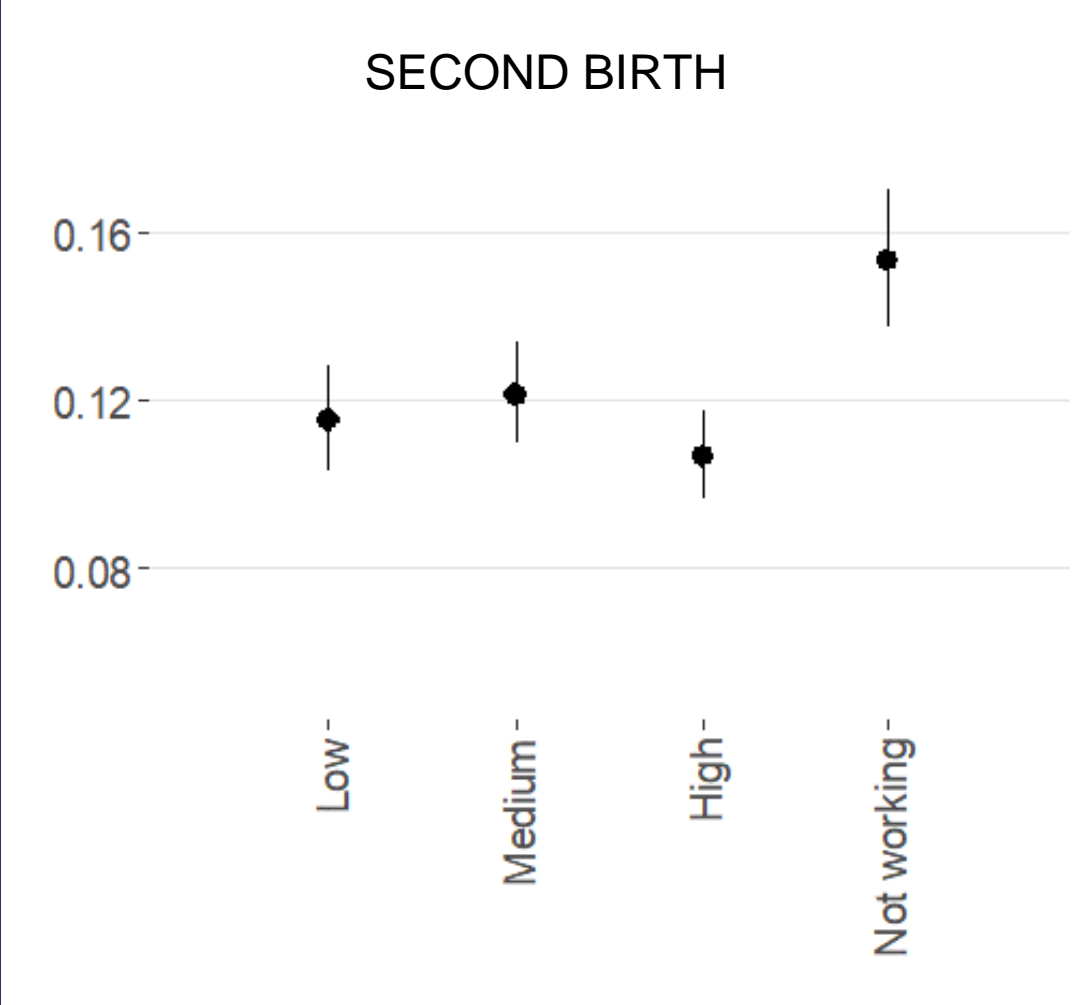
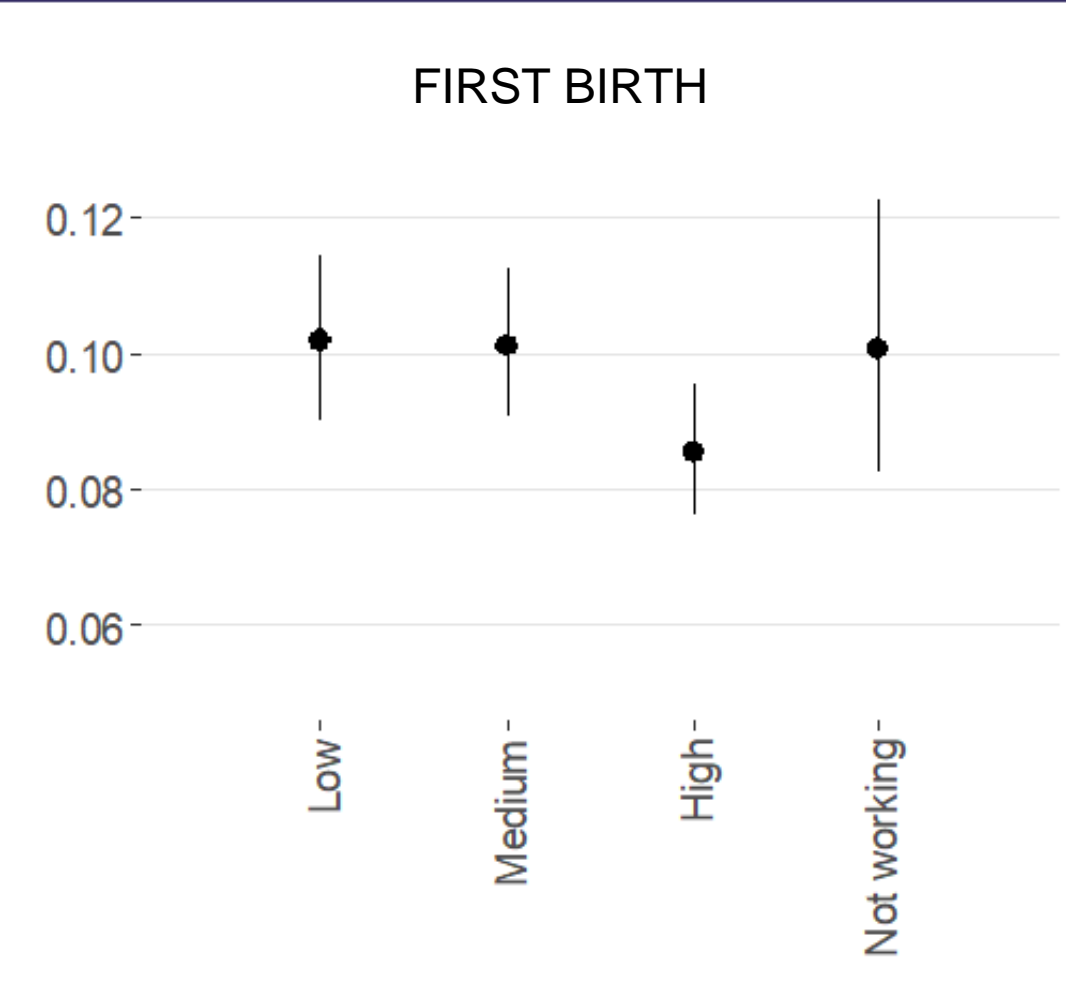


## SECOND BIRTH



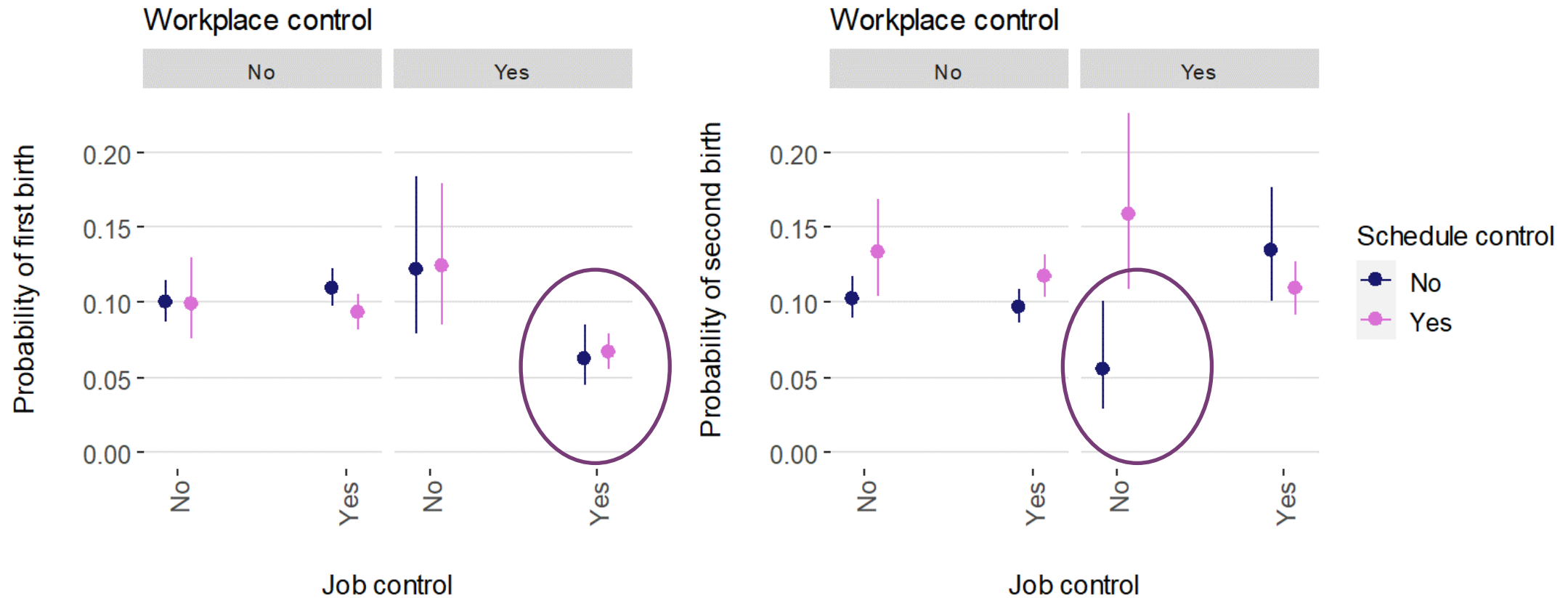


# HOW?



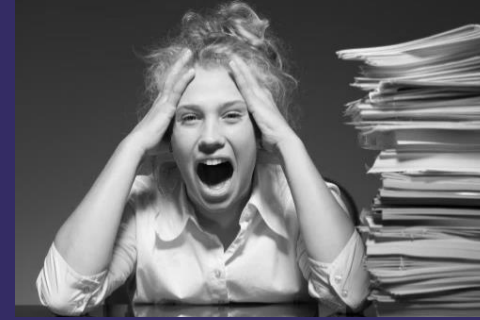
## FIRST BIRTH

## SECOND BIRTH





- Better skilled workers, less exposed to automation, more likely to have children
- Flexitime and flexiplace, a feature of highly skilled work, can help people having children unless it also involved job autonomy (HOW you work)
- More on knowledge-intensive work



- More comparative research needed
- To what extent these changes explain fertility decline
- To what extent they contribute to the changing edu gradient in fertility?
- Only timing or also quantum effects?

# LabFam Individual Biographies

Three separate but interconnected histories:

- Fertility history
- Partnership history
- Employment (& education) history



Harmonized from longitudinal databases:

HILDA  
SHP  
PSID  
GSOEP  
UKHLS  
FSS (Italy)

# THANK YOU!



POLSKIE POWROTY  
POLISH RETURNS



European  
Research  
Council



UNIVERSITY OF WARSAW  
Faculty of Economic Sciences

