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Adoption of industrial robots and fertility

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Labour force participation (LFP) and fertility

- source of income
- opportunity costs / work-family conflict
- social context: family policies, social norms

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?

- Changing structure of the labour demand
- Effects on wages, employability, stability and certainty of employment
- Structural LM change (not cyclical!)
- Growing disparities between high and low-to-middle skilled

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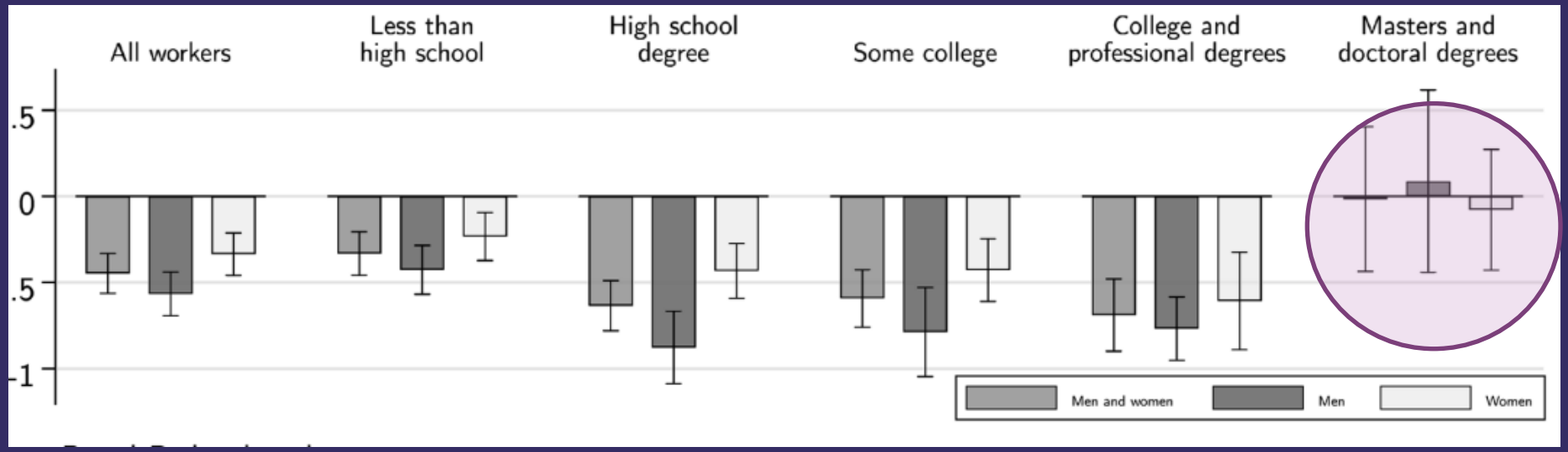
Automation and employment

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



Source: Acemoglu and Restrepo 2020

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

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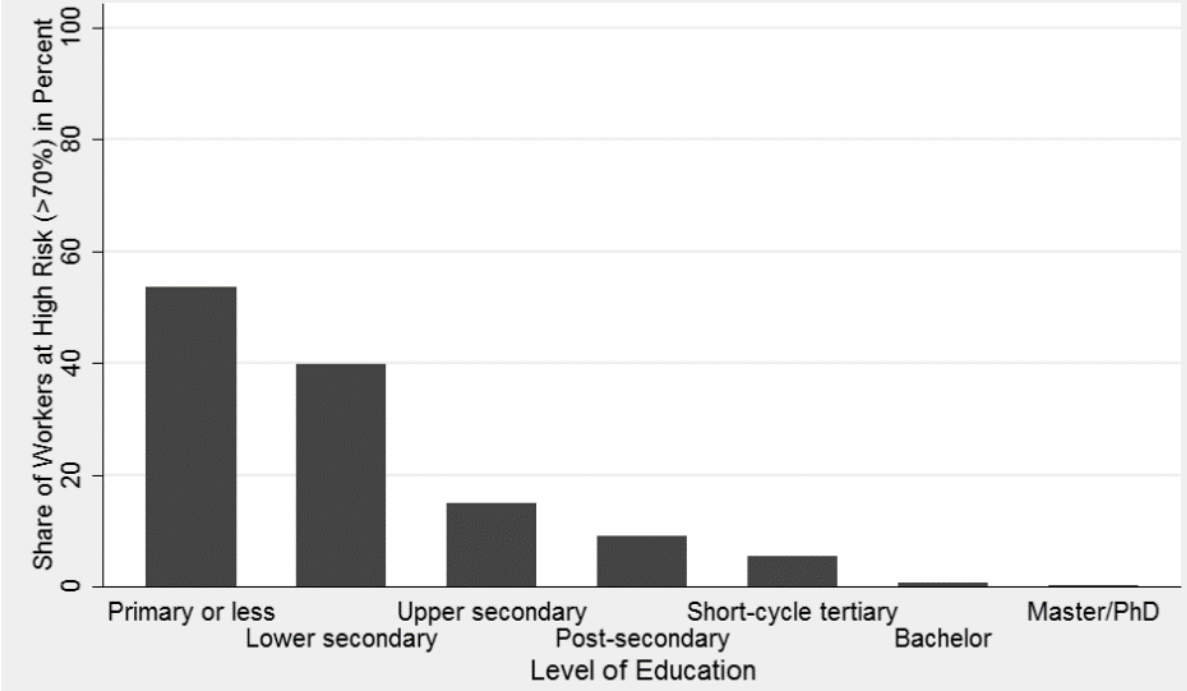
Automation and employment

- 9-14% of jobs at high risk of full automation (more than 70% of tasks automatable)
- 25-32% jobs at medium risk (50-70% of tasks automatable)

Source: Arntz et al. (2017), Nedelkoska and Quinitini (2018)

Figure 6. **Share of Workers with High Automatibility by Education**



Source: Authors' calculation based on the Survey of Adult Skills (PIAAC) (2012)

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Past research

?

Anelli et al. (2021):

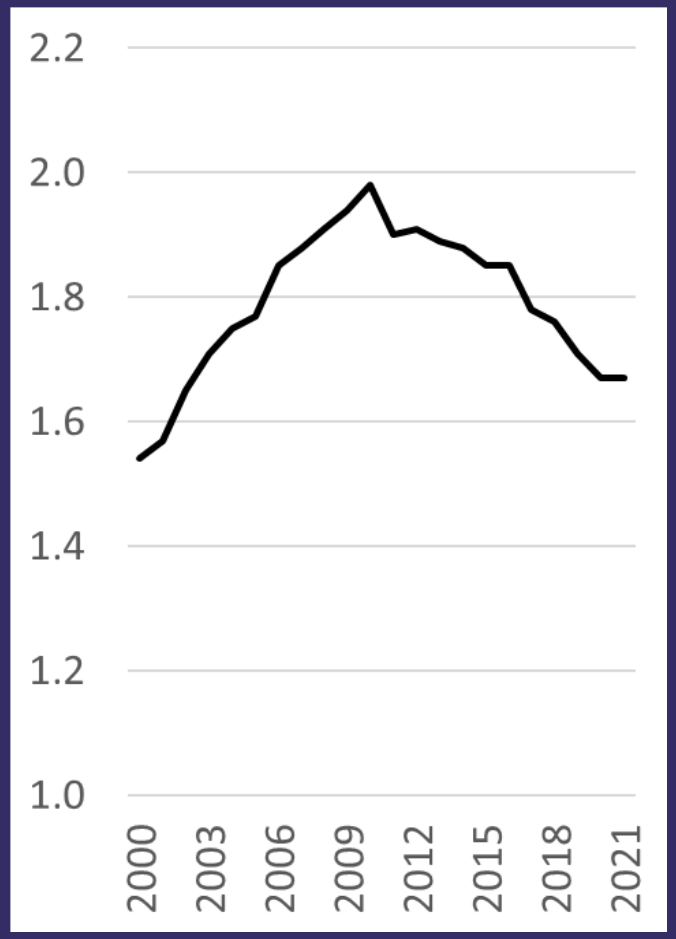
- regional study (commuting zones in the US)
- adoption of industrial robots → more cohabitation and divorce, decline in marital fertility, increase in non-marital fertility

Matysiak, Bellani & Bogusz (2023):

- Regional study (NUTS-2, 6 European countries)
- Negative effects on fertility mainly in regions with low educated populations

Sweden

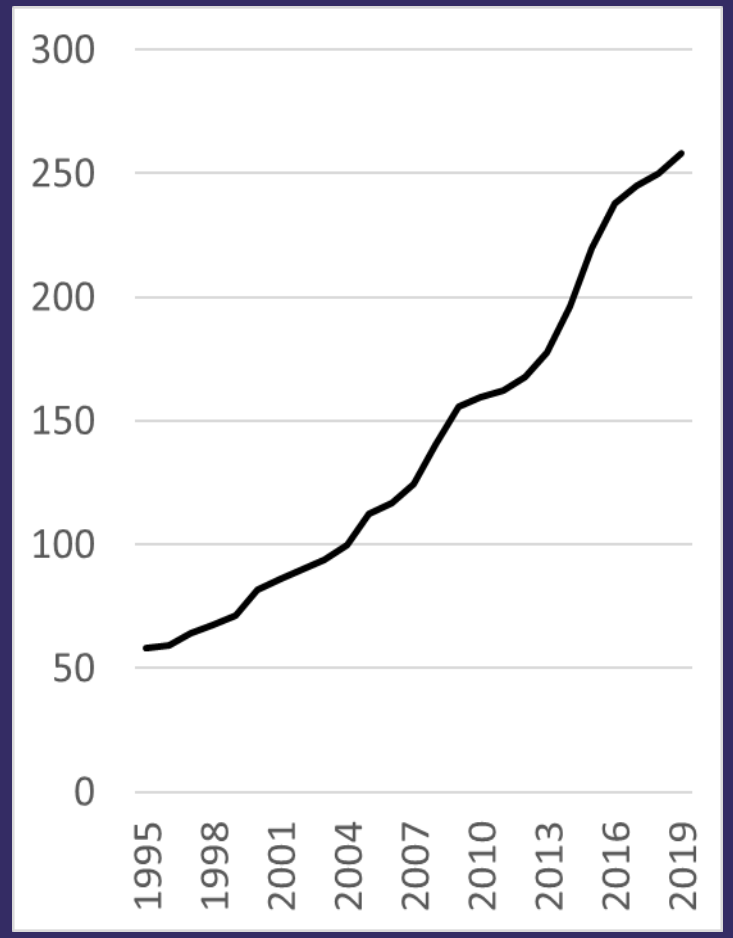
Total fertility rate



- Strong suport for combining work and care and increasing gender equality in the labour market and at home
- High labour force participation of women and mothers
- No educational differences in completed fertility
- Highly technologically developed
  - 5th position in adoption of industrial robots worldwide

Robot density

Number of inustrial robots per 10,000 workers in manufacturing



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Empirical study

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Data:

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

Period: 1993-2017

Measure:

- Exposure to robots

Method:

- Discrete-time EHA

$$Exposure\ to\ robots_{i,t} = \frac{robots_{i,t}}{empl_{i,t_0}}$$

replacement of initial employment (at *t0*) in the industry *i* by robots

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Modelling

Discrete-time event history model with a complementary log-log function:

$$\log\left[-\log\left(1-\lambda_{i,t}\right)\right] = \alpha_t + \beta x_{i,t-2}$$

$\lambda_{i,t}$ - conditional probability of experiencing the event in year t provided it has not occured before

Events:

- Marriage
- 1st, 2nd, 3rd birth
- Divorce

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Modelling

Discrete-time event history model with a complementary log-log function:

$$\log\left[-\log\left(1-\lambda_{i,t}\right)\right] = \alpha_t + \beta x_{i,t-2}$$

$x_{i,t-2}$:

- Age
- (Age of the previous child (in higher order birth models))
- Calendar year
- Education
- Employment status (works in a sector with / without robotisation, does not work)
- Exposure to robots
- Firm size
- Seniority status

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Modelling: IV

Endogeneity of robot adoption and fertility proces due to domestic or sectoral shocks

IV:

$$Exposure\ to\ robots_{i,t} = \frac{robots_{i,t}}{empl_{i,t_0}}$$

Using stock of robots in other countries which are similarly (Finland, Denmark) or even more advanced (Germany) in automation

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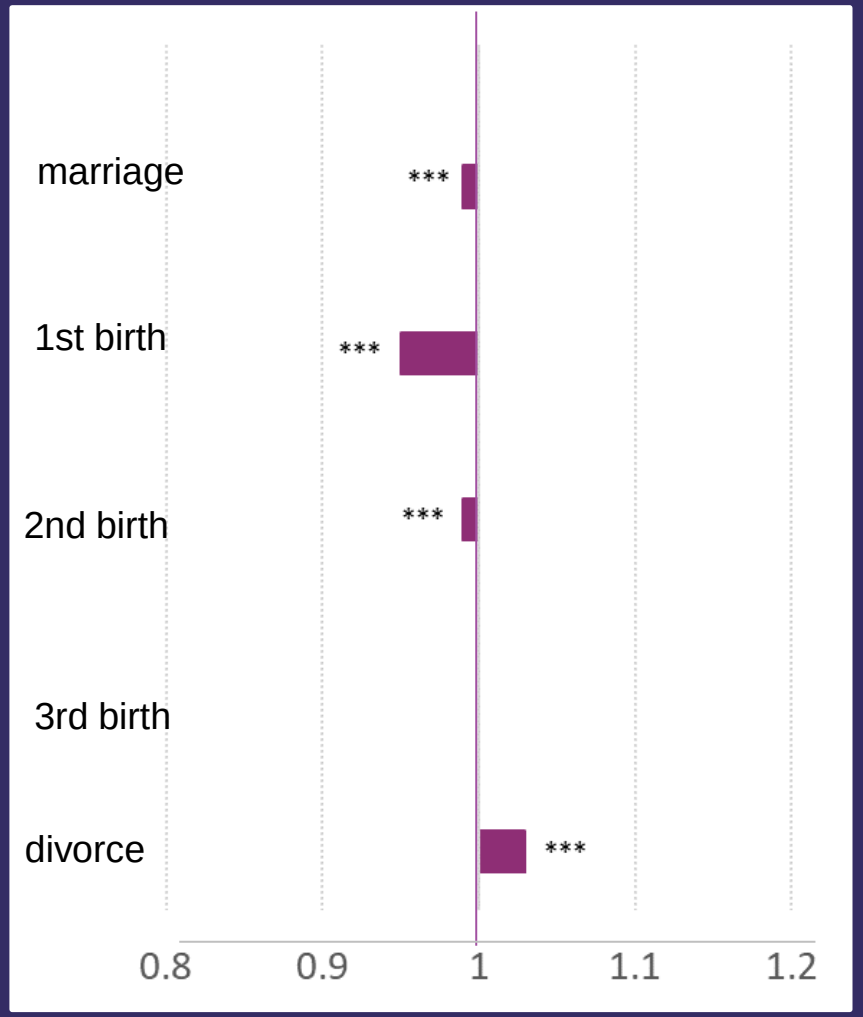
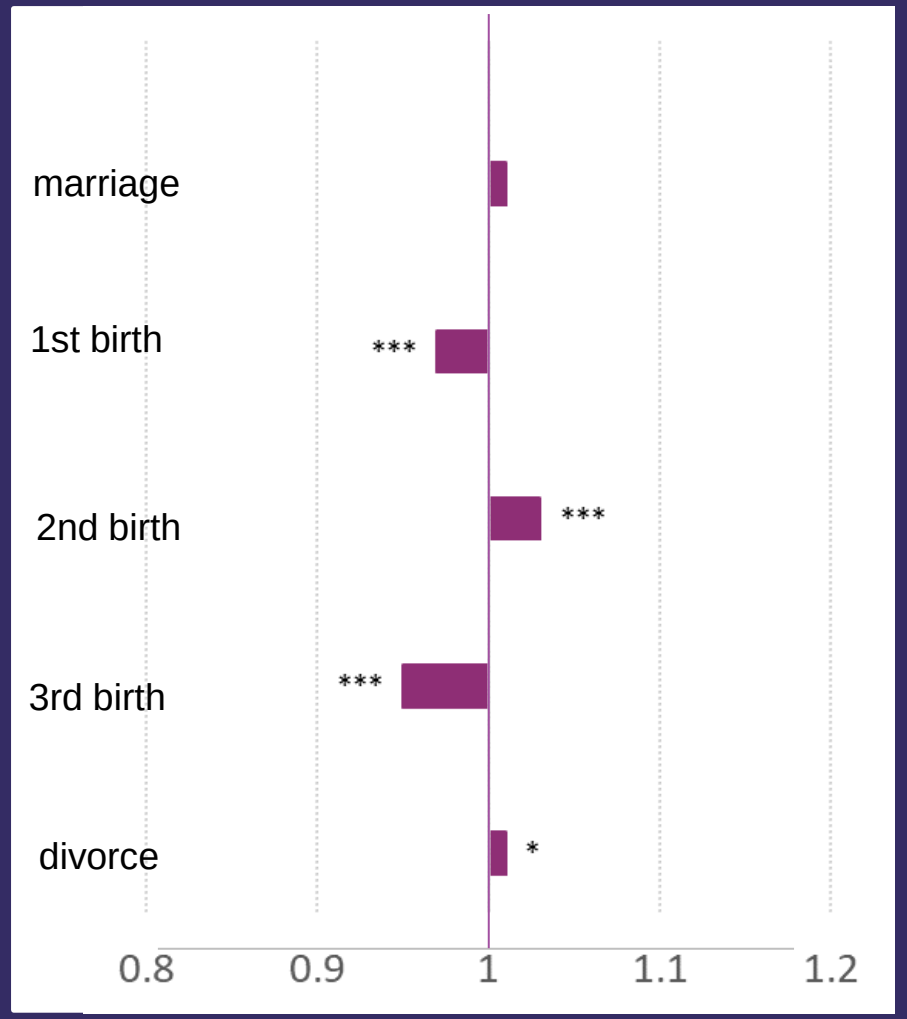
Fertility effects of automation, Sweden

MEN



WOMEN

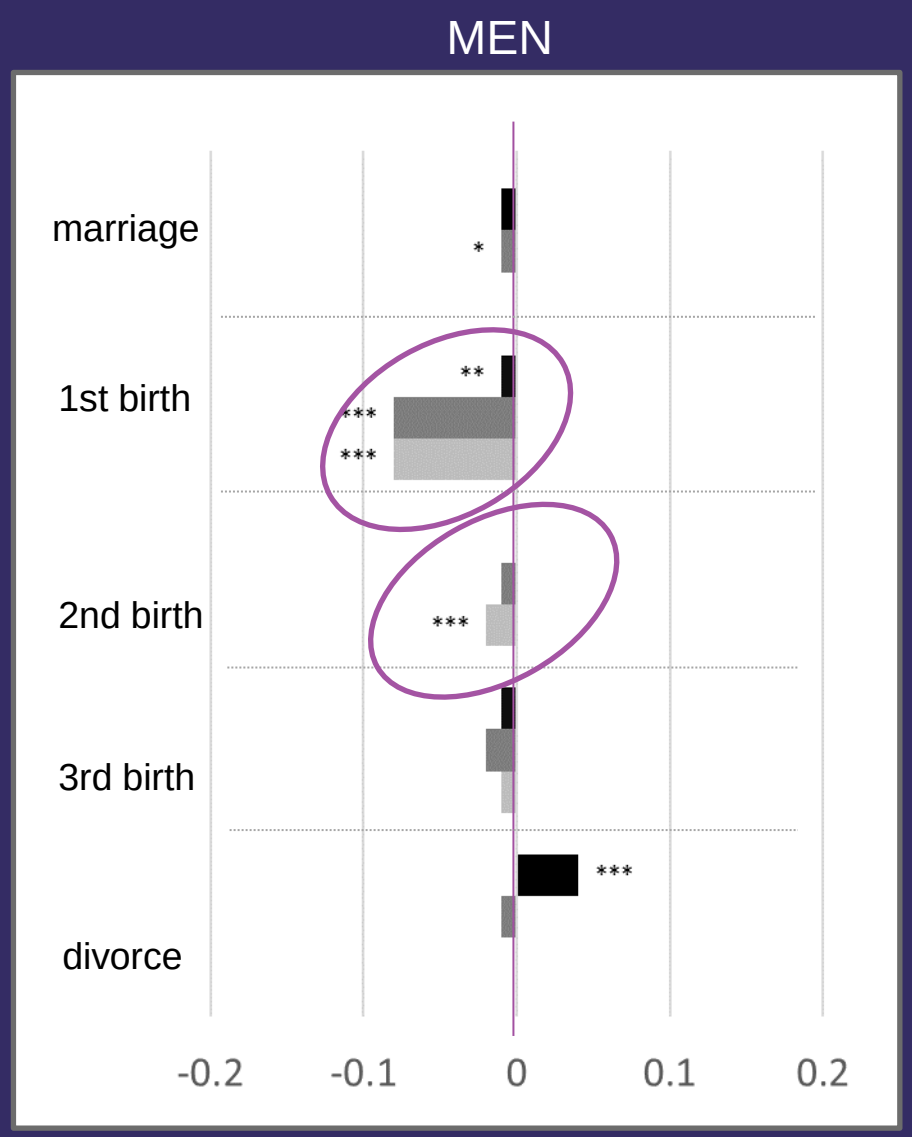


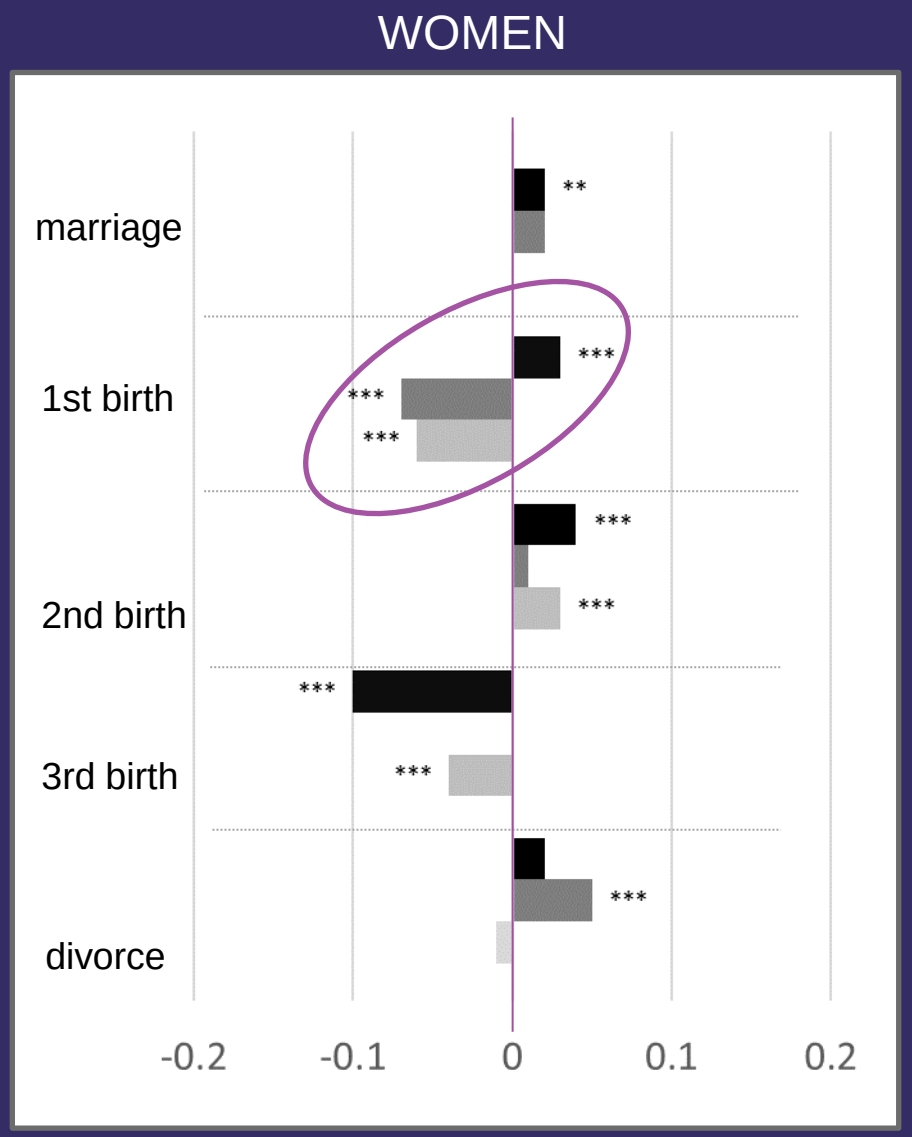
Note: A change in the risk of an event due to an increase in robot adoption in an industry by one standard deviation

Fertility effects of automation, Sweden

Note: A change in the risk of an event due to an increase in robot adoption in an industry by one standard deviation

Fertility effects of automation: temporal change





post recession
recession
before recession

Note: A change in the risk of an event due to an increase in robot adoption in an industry by one standard deviation

Conclusions

- Very weak and rather negative effects on marriage, birth risks & marital stability
- Clear socio-economic gradient in how robot adoption affects family formation
  - Negative effects for the low / medium educated
  - Positive for the highly educated
- No intensification of the negative effects of robot adoption over time

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Outlook

- Implement the IV
- Examine temporal changes within educational groups

- Does structural LM change / adoption of robots cause a reversal in educational gradient in fertility?

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POLSKIE POWROTY
POLISH RETURNS

Horizon 2020
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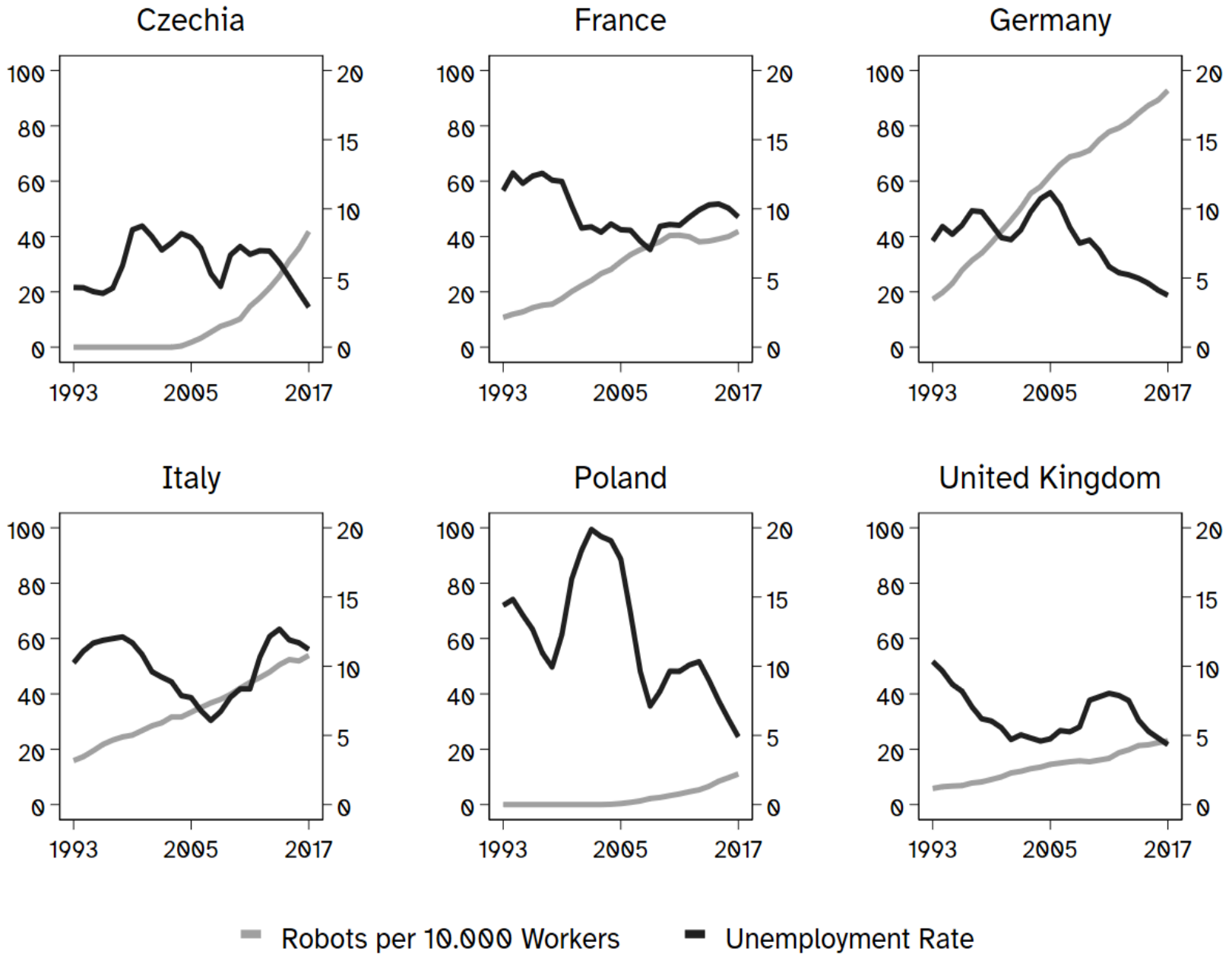

Source: Matysiak, Bellani, Bogusz 2023