

# Measuring the educational gradient of period fertility behaviour in Europe

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ANGELA GREULICH - SCIENCES PO PARIS (CRIS) & IUF

LAURENT TOULEMON - INED (PARIS)

# Motivation

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- Total fertility rates stagnate below replacement level in many European countries, and they even have been decreasing over the last years in several countries: **Who is particularly concerned and why?**
- **Between-country** differentials: institutional support for dual earner couples (formal childcare, parental leave) , modern gender and family norms allowing (out-of-wedlock births, co-habitation, patchwork families) (Adsera 2011, Matysiak and Vignoli 2008, Kreyenfeld 2010, Duvander et al. 2010, Rindfuss et al. 2010, Thévenon 2011, Rovny 2011, Vignoli et al. 2012, Neyer et al. 2013, Luci-Greulich and Thévenon 2013, Thévenon and Solaz 2014, Aassve et al. 2014, Rendall et al. 2014, Goldscheider et al. 2015, Esping-Andersen and Billari 2015, Barbieri et al. 2015).
- **Within-country** differentials: negative educational gradient for **completed** cohort fertility (Tomas Sobotka [www.cfe-database.org](http://www.cfe-database.org); Sobotka 2020; Nisén et al. 2021)

# Motivation

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We miss data on the educational gradient of **period** fertility levels covering **all European** countries

- Empirical modeling focusing on fertility related to only one birth-order (Van Bavel and Rozanska-Putek 2010, Klesment et al. 2014, Trimarchi and Van Bavel 2018 and 2019, or Rendall and Shattuck 2019)
- Calculus of age-specific fertility rates by education not possible as education evolves over age
- Purely cross-sectional setting: TFR for low-educated would be underestimated

# Our approach to measure the educational gradient of period fertility

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- Data source: European Union's Statistics of Income and Living Conditions (EU-SILC) to cover *all European countries*
- *Semi-retrospective approach* to observe fertility behavior of cohorts that are currently at childbearing age, while at the same time recording the educational level correctly.
- *Bayesian statistics* to obtain credible intervals for age, education- and parity-specific birth probabilities
- *Multi-state life tables* to obtain parity-specific and total birth intensities by education
- *Post-stratification* to be consistent with national estimates of period fertility.

# Data

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- EU-SILC CS 2012 to calculate period fertility levels for 2010
- Own-children method: children in the observed household
- Two-year delay between the year of observed childbirth and the survey year to reduce fertility-linked attrition (Greulich and Dasré, 2017)
- Education (UNESCO ISCED):
  - ‘low education’: pre-primary, primary, and lower secondary
  - ‘medium education’: upper secondary and post-secondary non-tertiary
  - ‘high education’: first stage and second stage of tertiary education

# Semi-retrospective approach

## Synthetic cohort for ages 25+

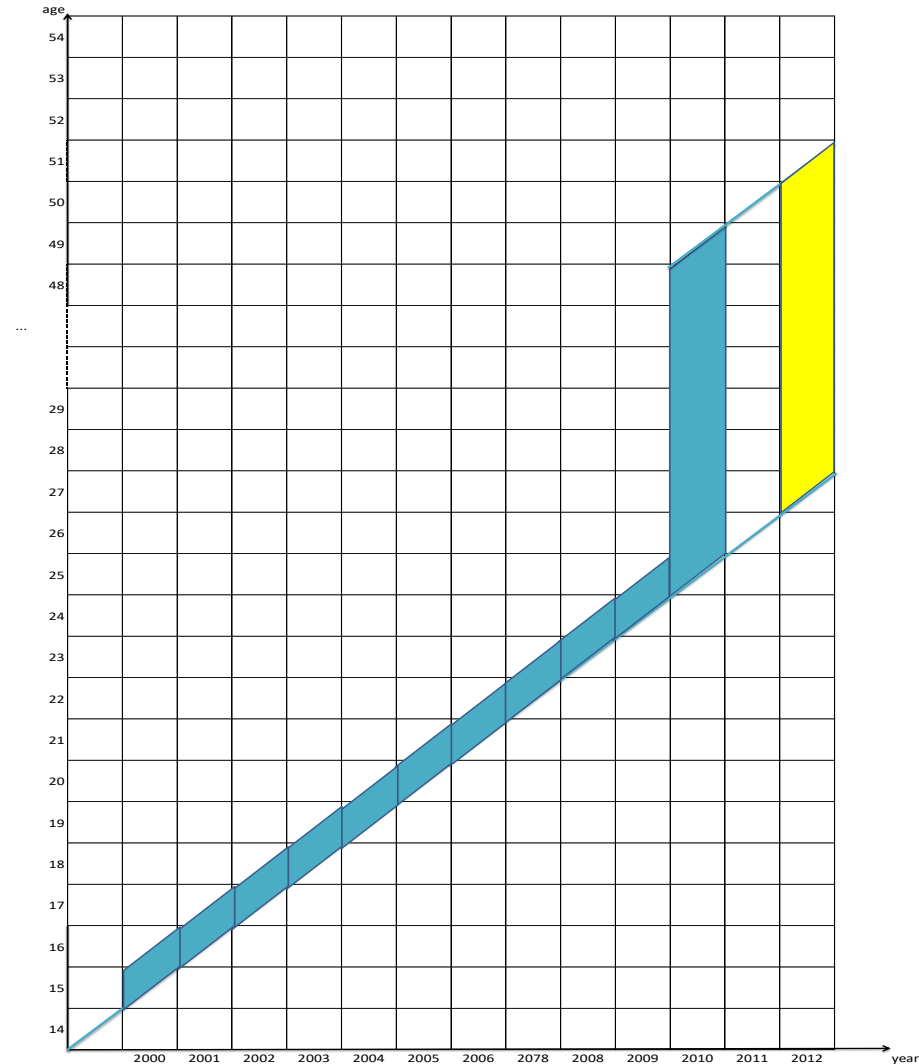
(age 25 in 2010 = age 27 in 2012: education completed;

births observed in 2010)

## Retrospective approach for ages 15-24

(i.e. education is observed at age 27; only 1 cohort: 1985;

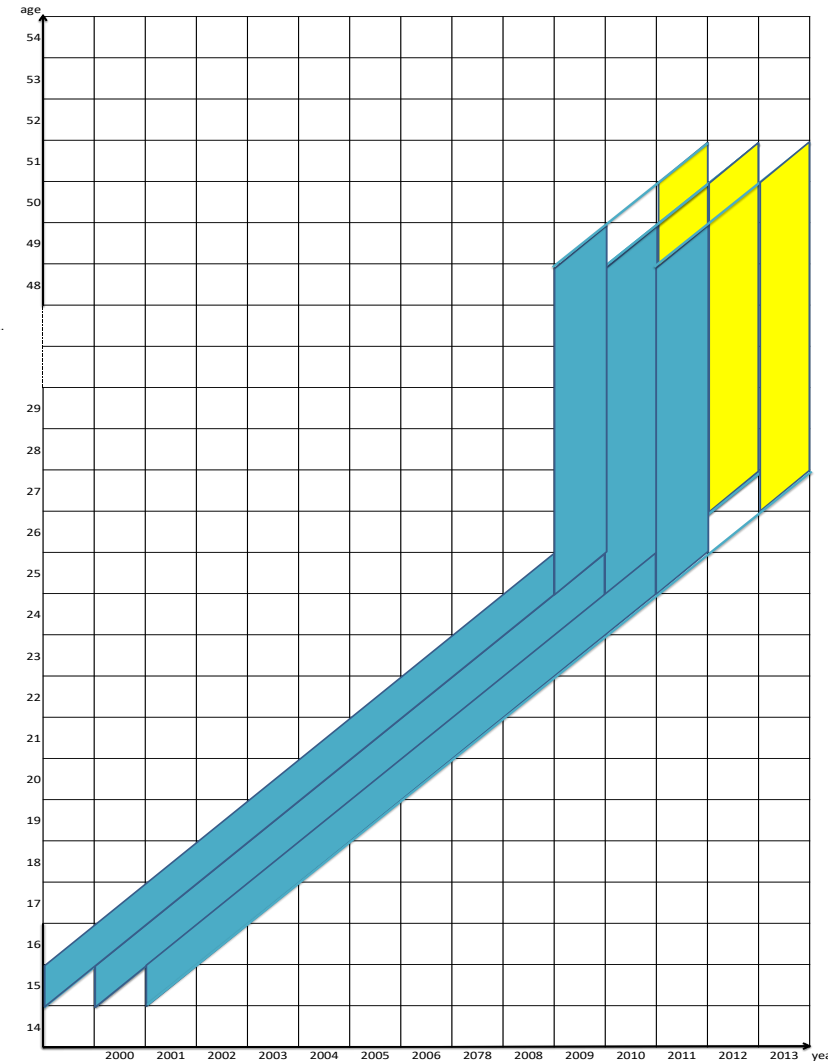
Births observed between 2000 and 2009)



# Semi-retrospective approach

Combination of 3 waves to increase sample size

Births observed in 2009, 2010 and 2011 by using cross-sectional waves of 2011, 2012 and 2013



# Bayesian statistics

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Problem: very small sample size for some specific groups

Solution: we compute the posterior from the prior with

**Bayes' theorem:**

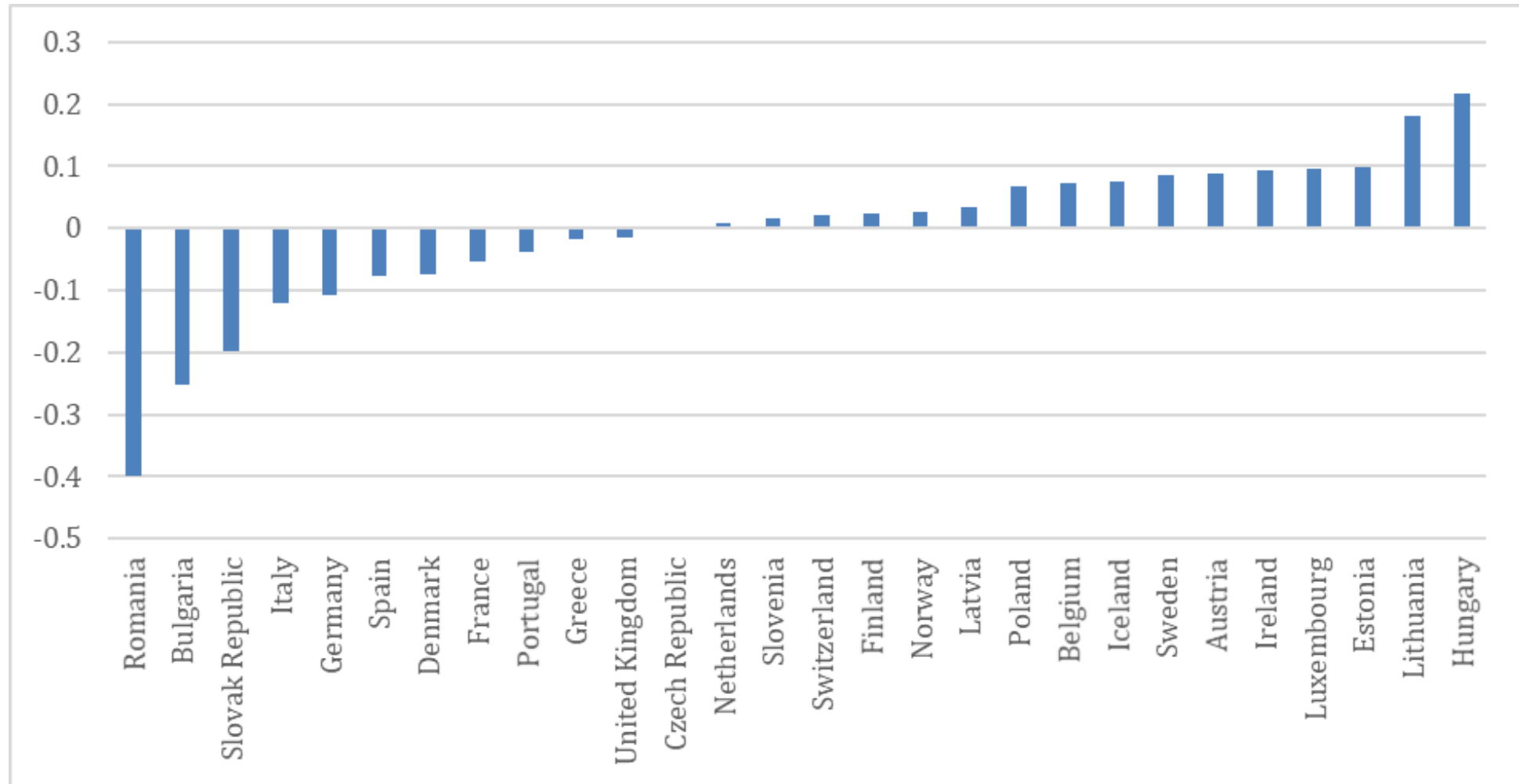
- Each age- and parity- and education-specific probability is estimated based on a **prior**
- Prior: the age- and parity-specific probabilities (averaged over all educational groups)
  - These priors are themselves estimated from other priors: the age-specific probabilities (averaged over all parities)
- **Posterior:** age-and parity- and education-specific probabilities based on the prior

$$Posterior = \frac{n + 2 \text{ prior}}{N + 2} = \frac{2}{N + 2} \text{ prior} + \frac{N}{N + 2} \frac{n}{N}$$

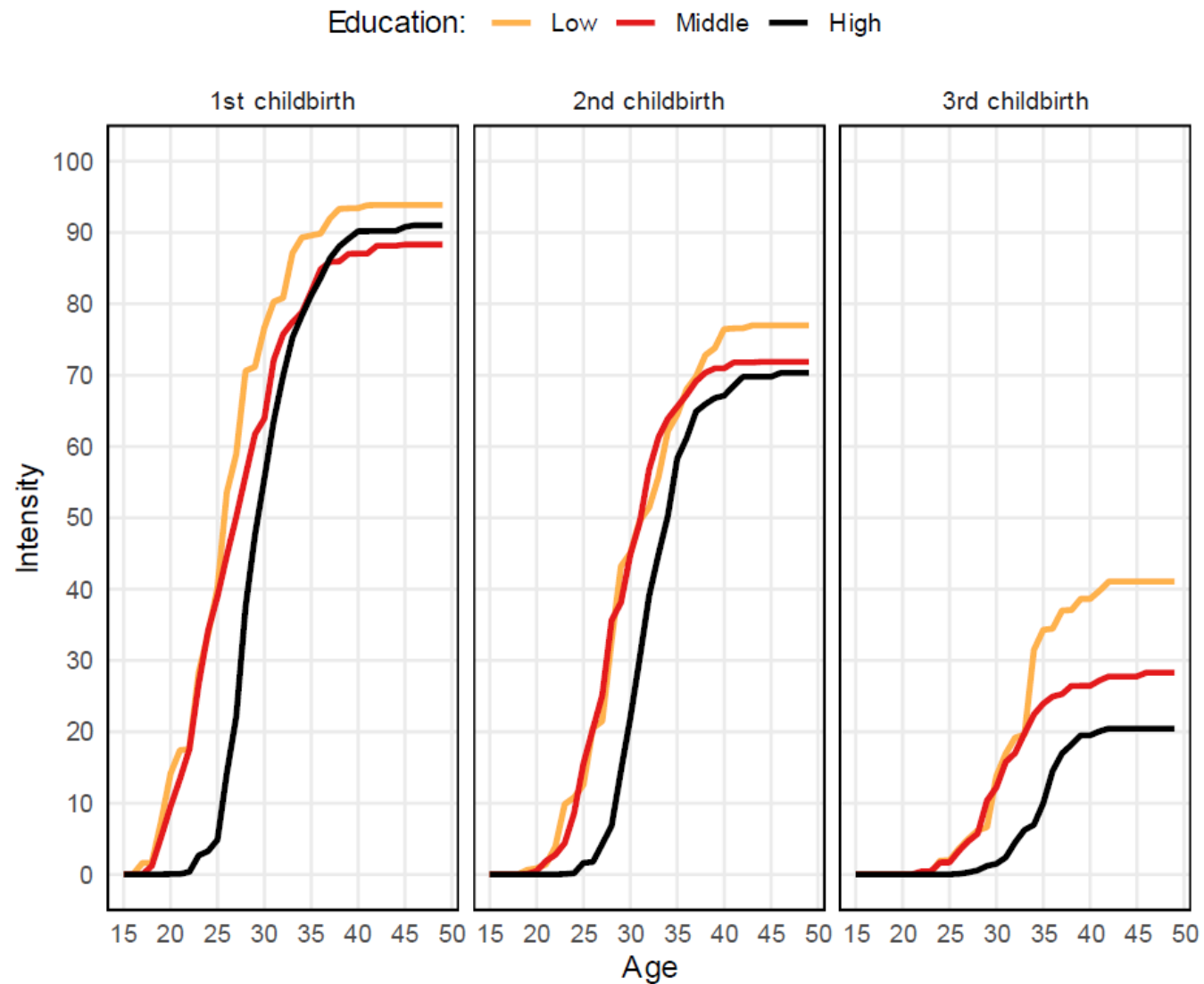


# Post-stratification

Relative difference between EU-SILC measure and national estimates



# Birth intensities by education- France

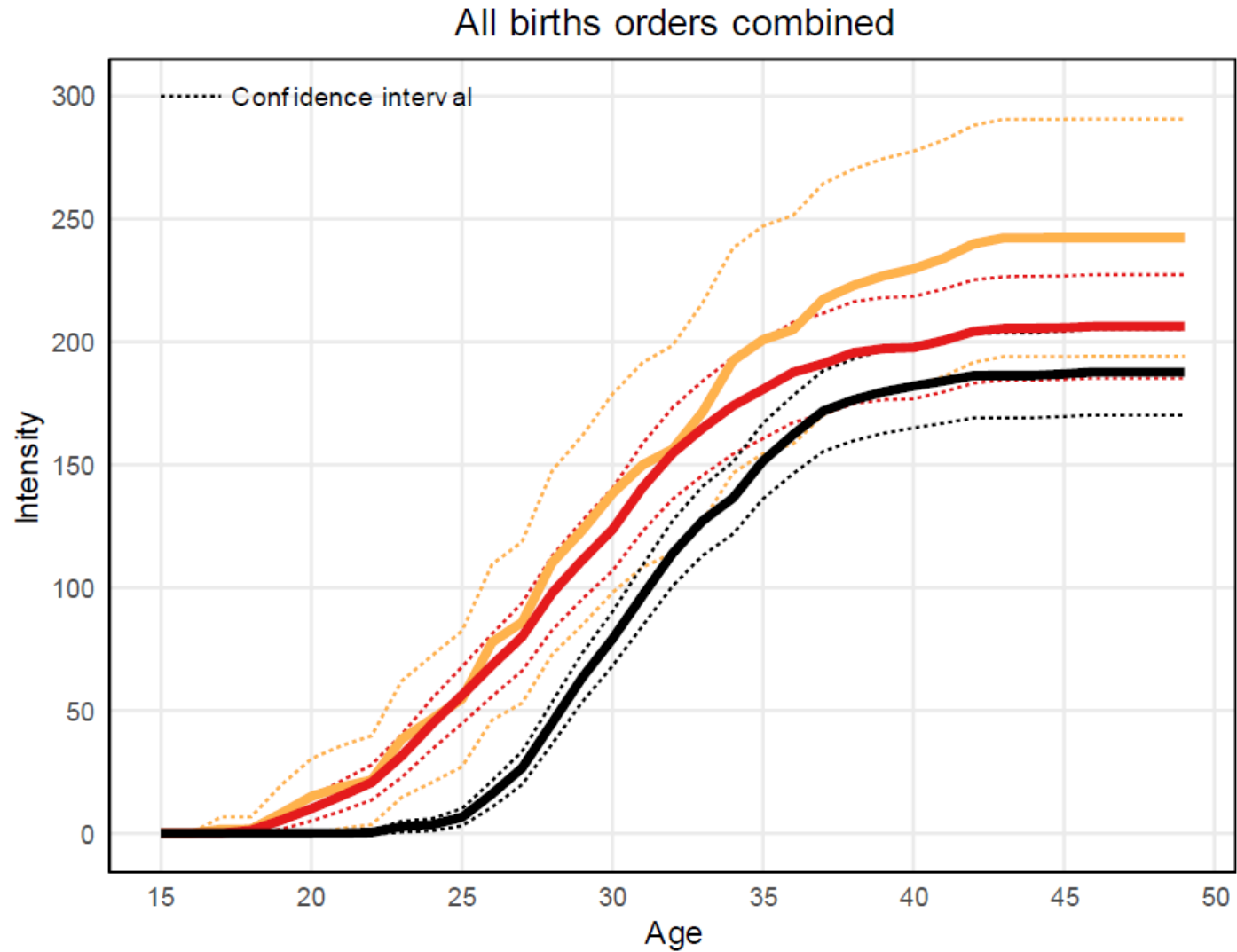


Education: Low: pre-primary, primary, lower secondary; Middle: upper secondary, post-secondary; High: tertiary

Data source: EU-SILC, CS 2011-2013: childbirths observed in 2009, 2010 and 2011

Women aged 15-49, semi-retrospective approach

# Birth intensities by education- France

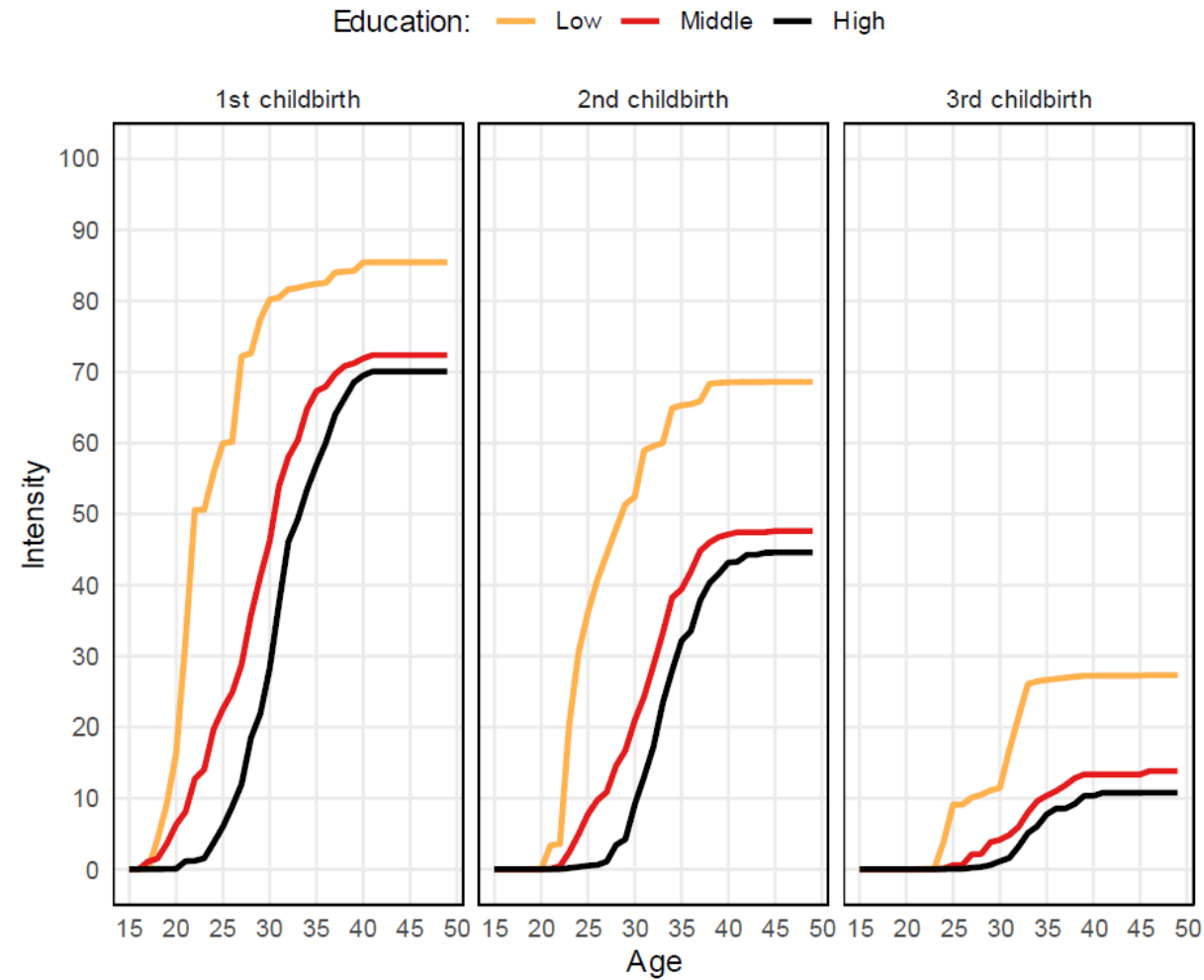


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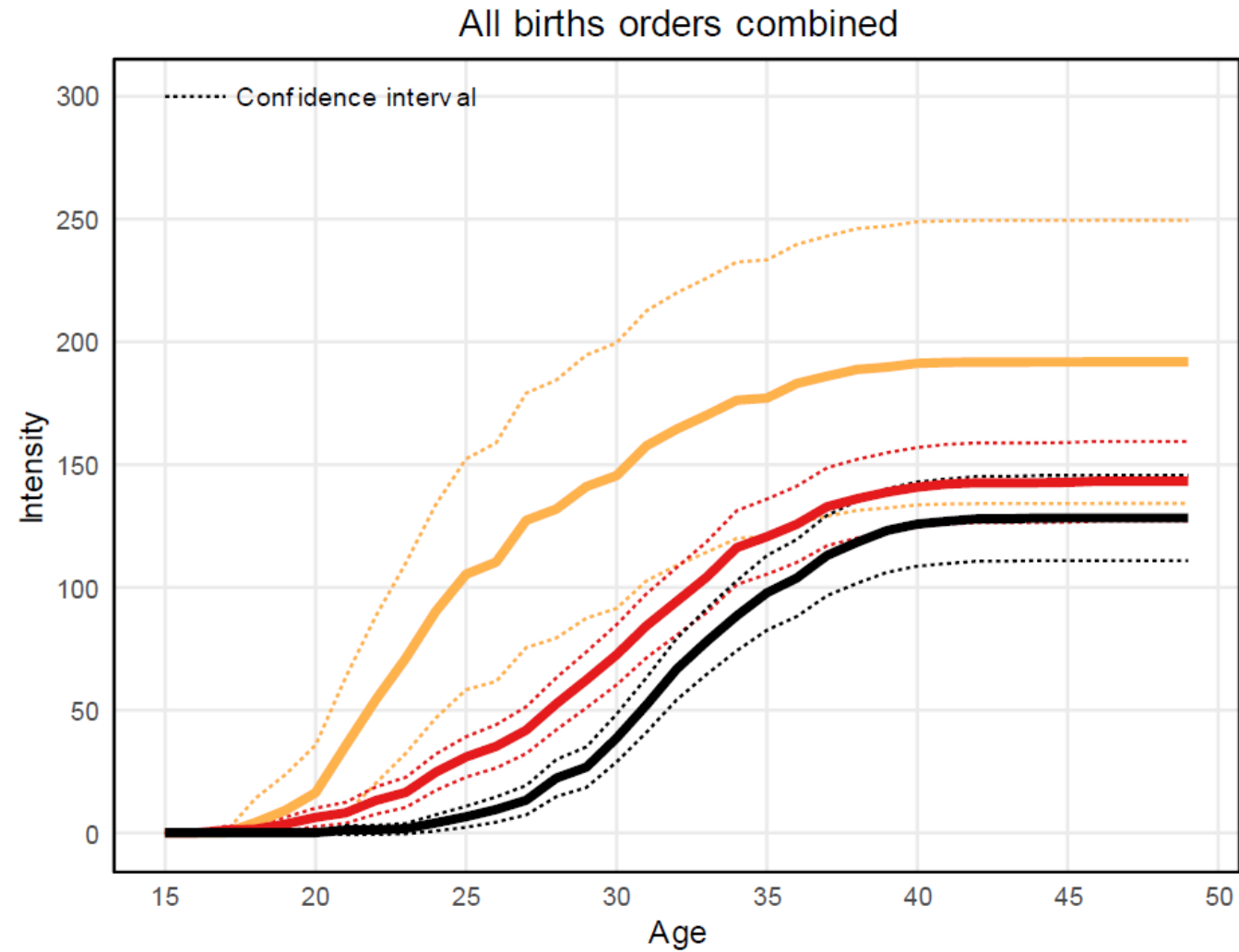
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Women aged 15-49, semi-retrospective approach

# Birth intensities by education - Germany



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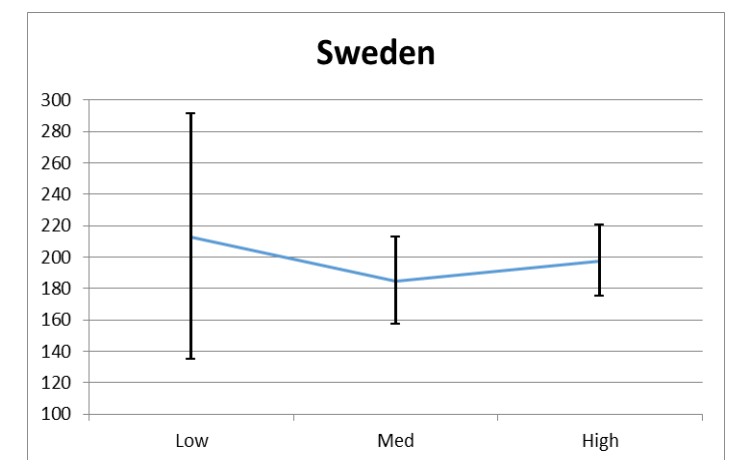
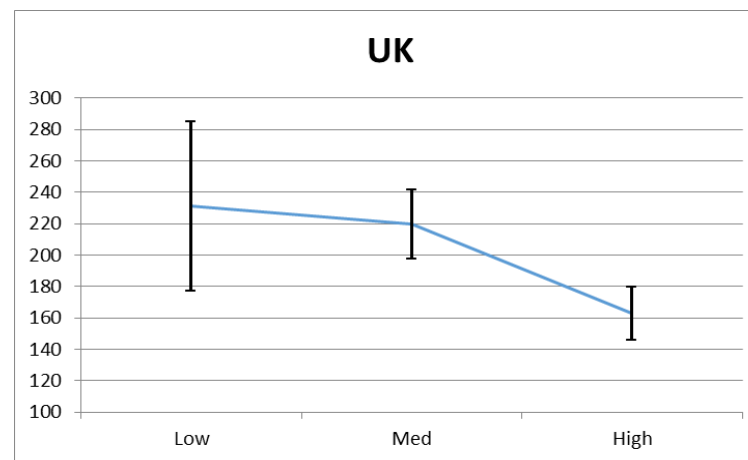
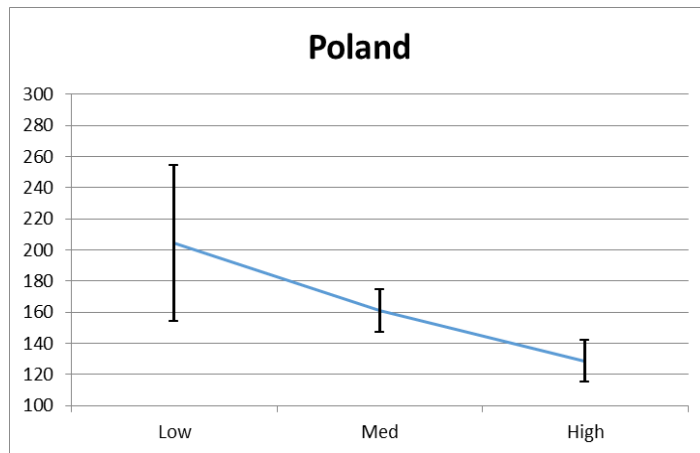
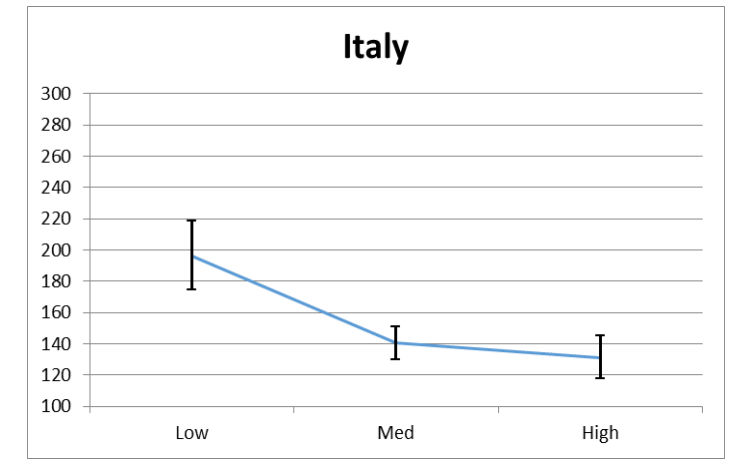
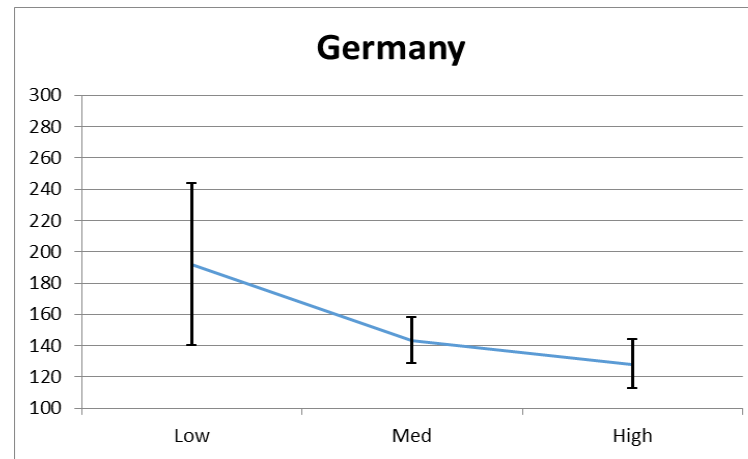
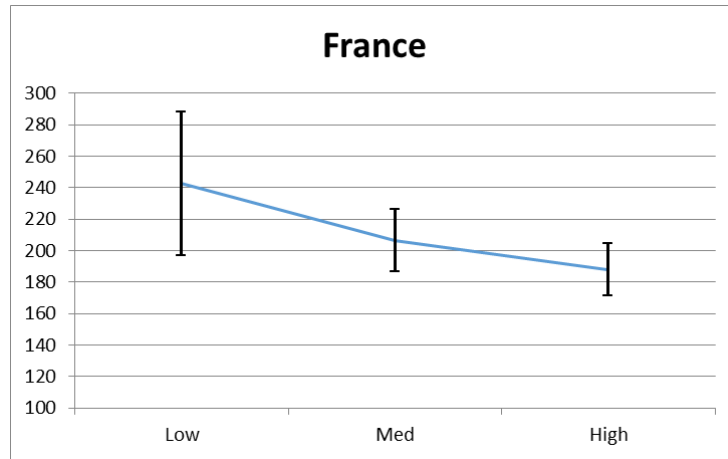


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Women aged 15-49, semi-retrospective approach

# Total birth intensities by education and country (births per 100 women)

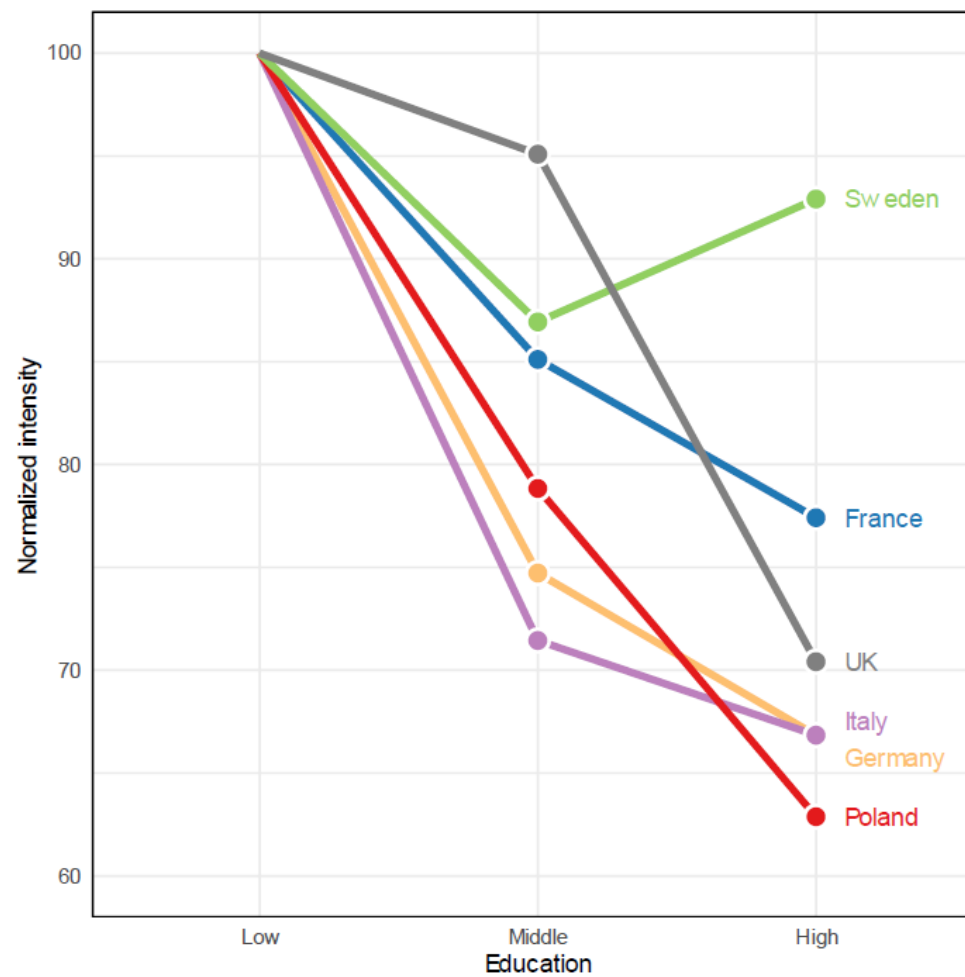


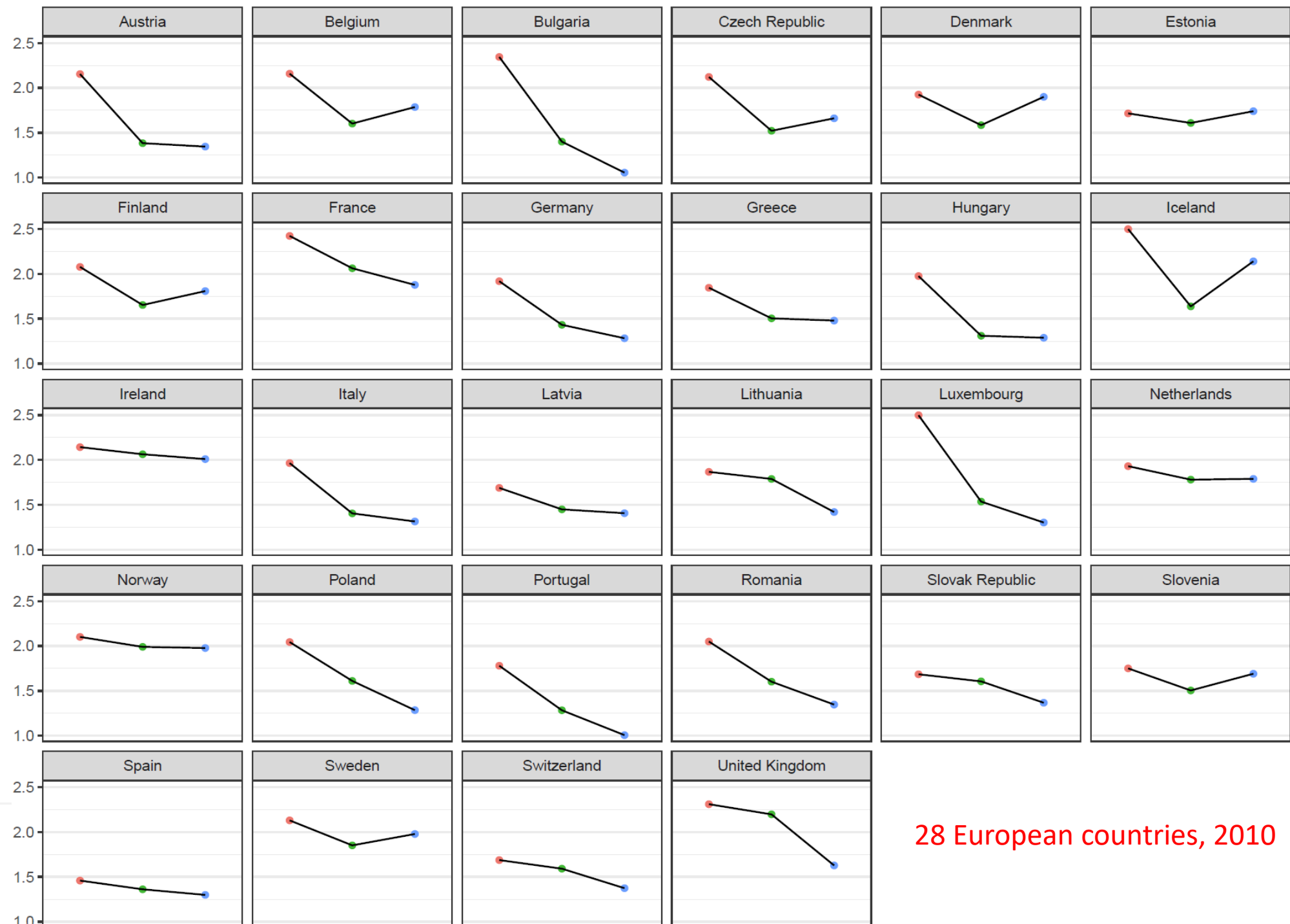
Education: Low: pre-primary, primary, lower secondary; Middle: upper secondary, post-secondary; High: tertiary

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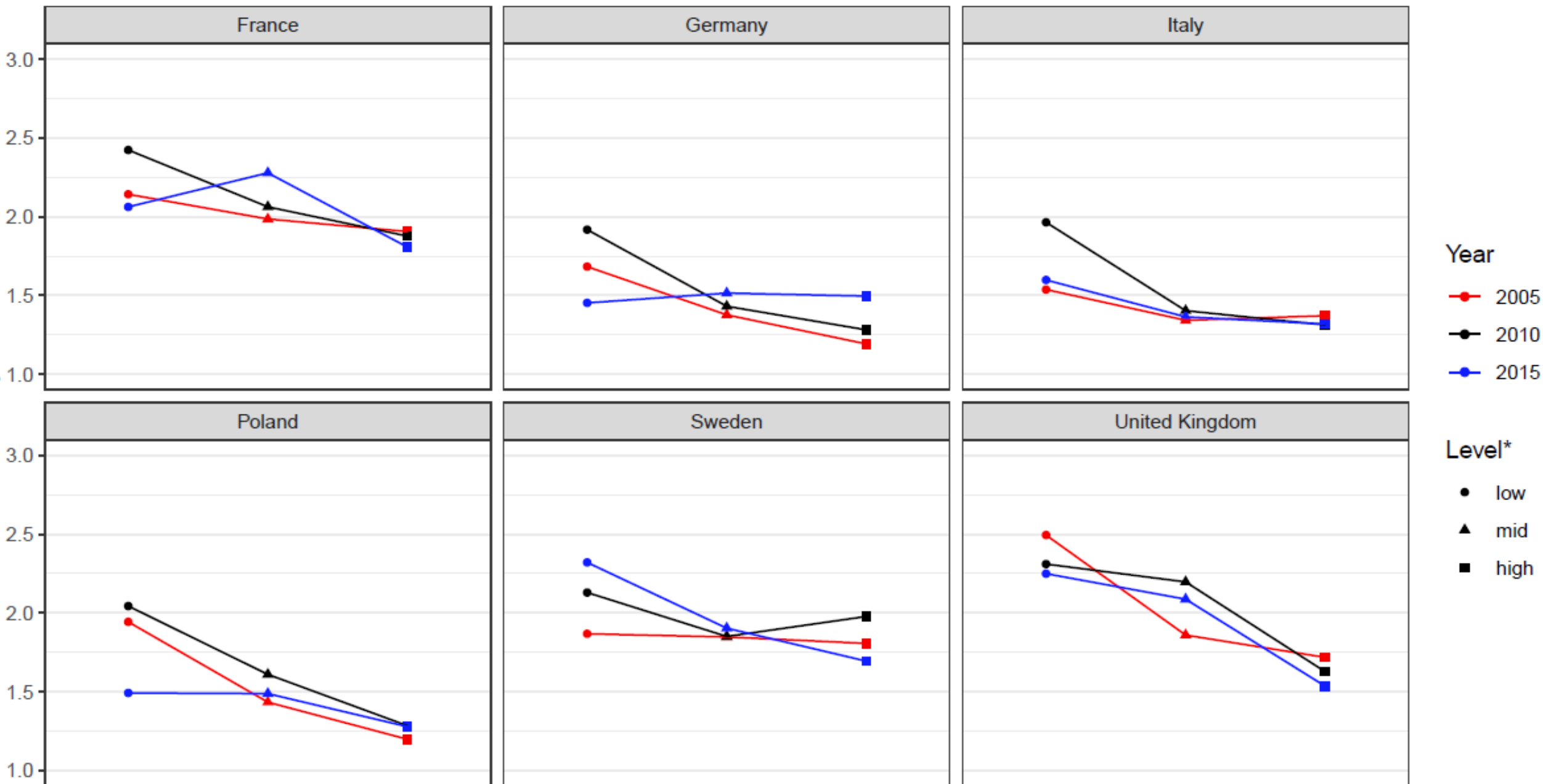
## Total birth intensities by education and country (normalized)





28 European countries, 2010





# Next steps:

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- Make the data available online (32 European countries, yearly measures from 2005 on)
- Data quality check: census, register data etc.
- Substantial analysis of the evolution and the determinants of educational gradients of period fertility levels in Europe

THANK YOU!