Spatial and temporal variation of late fertility across European regions

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Contemporary trends

Late fertility is on the rise

- Increasing mean age at first birth & prevalence of late births at advanced reproductive ages (35+ and 40+) (e.g.: Kohler, Billari & Ortega, 2002; Beaujouan, 2020; Prioux, 2005)

Consequences that span health and socioeconomics realms

- Late mothers tend to have greater socioeconomic resources (Myrskylä et al., 2017)
- Larger health risks during pregnancy and delivery, as well as decreased fecundity (Schmidt et al., 2012; Leridon, 2004)
- Potential impact on future fertility rates (Beaujouan et al., 2023)

Measuring late fertility

Definition of late fertility

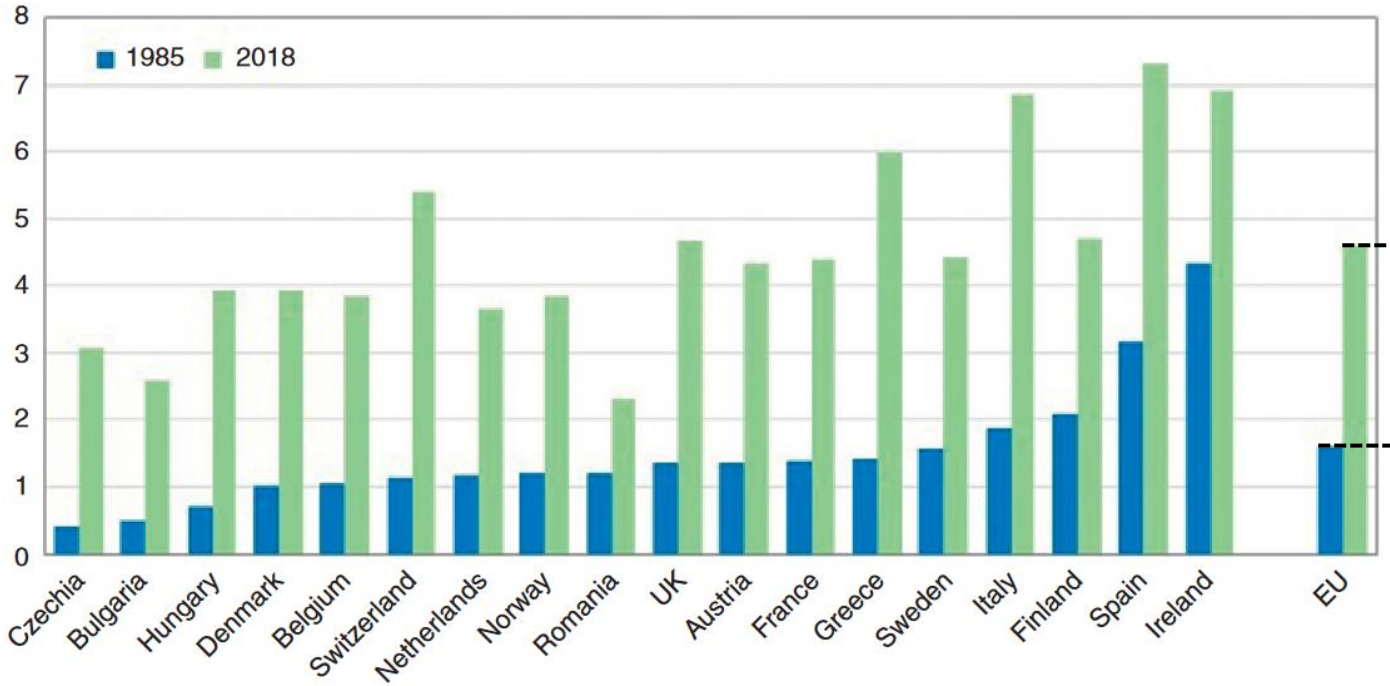
- Subjective and embedded in the fertility levels and norms prevailing across time and space (Beaujouan, 2020)
- Diverse age benchmarks for late fertility, including ages 35+, 40+, and 45+ (Kohler, Billari & Ortega, 2002; Prioux; Beaujouan & Sobotka 2022)

Late fertility versus postponement

- Factors affecting late fertility include fertility postponement *and* recuperation
  - Postponing fertility doesn't necessarily result in a *full* recuperation and an increase in late fertility rates (Compans, 2021)

Late fertility is on the rise

Share of fertility rates at ages 40+ in total fertility (in %)



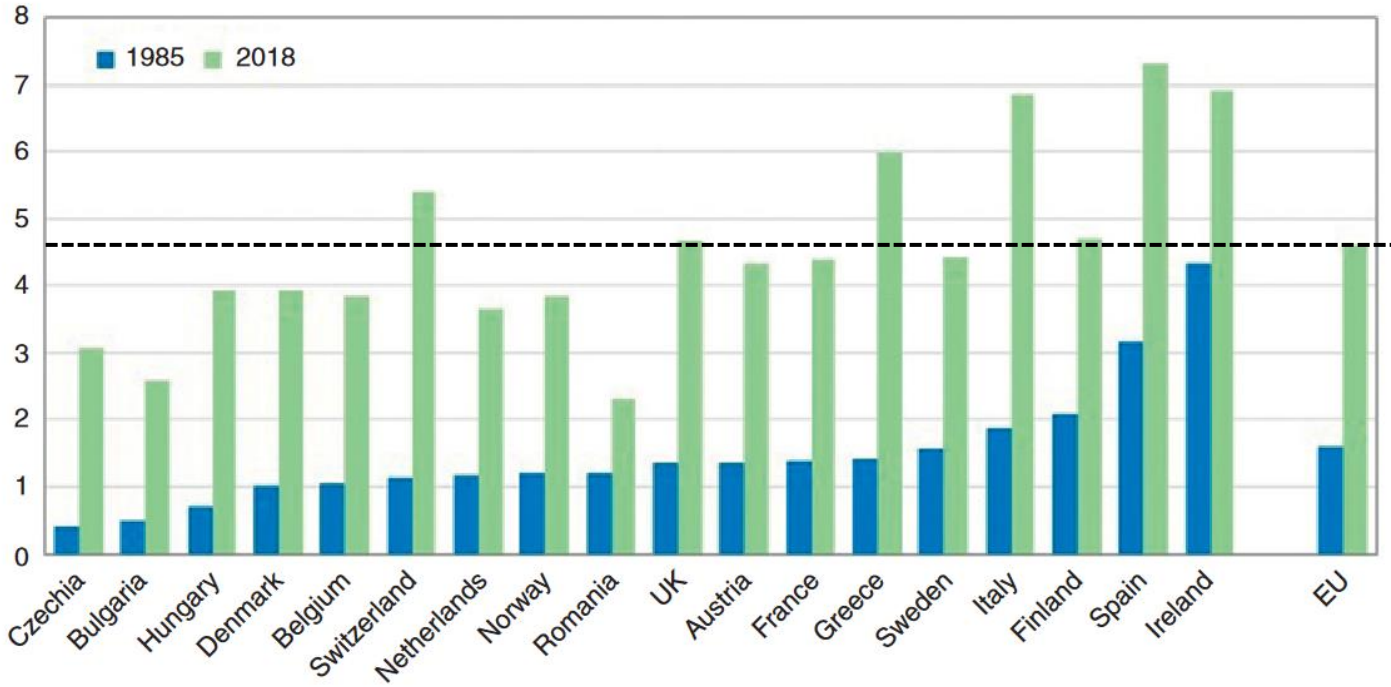
… tripled to 4.6% in 2018

1.6% in 1985

Source: Beaujouan & Sobotka (2022)

Heterogeneity *between* countries

Share of fertility rates at ages 40+ in total fertility (in %)



EU average
4.6% in 2018

Vast differences *between* countries

Source: Beaujouan & Sobotka (2022)

Heterogeneity *within* countries

Evidence so far

- **Spatial variation**
  - Urban areas exhibit higher prevalence of late fertility (Riederer & Beaujouan, 2023; Buelens, 2021; Campisi et al., 2022; Šprocha & Fitalov, 2022)
- **Temporal variation (Europe wide)**
  - MAB increased universally, but at different paces (Buelens, 2021)
- **Contextual factors explain diverse prevalence within countries**
  - Studies emphasize economic (Riederer & Beaujouan, 2023; Šprocha & Fitalov, 2022) and social context (Campisi et al., 2022)

→ Europewide analysis of the temporal and spatial variation of late fertility is missing

→ Have contextual factors driven the *change* in late fertility over time?

Research aims

1. **How has late fertility spread across European regions from 2002 to 2018?**

2. **What drives late fertility shifts across regions?**

   Estimating the extent to which shifts in late fertility are a result of

   - **Socioeconomic adaptation** Focus on established contextual factors that explain differentials in late fertility (e.g., Riederer & Beaujouan, 2023)
   - **Geographic diffusion** Focus on spread across regions: spatial dependence (studies on low fertility patterns: e.g., Vitali & Billari, 2015; Wu et. al, 2022)

→ Unprecedent analysis of late fertility with broader temporal *and* geographic scope

→ Contributing to the growing literature that considers space in fertility research (e.g., Campisi et. al, 2022; Goldstein & Klüsener, 2014; Vitali & Billari, 2015)

Data & measures

Eurostat & ESPON data

- **Geographic scope** 215 NUTS 2 regions across 24 European countries
- **Temporal scope** 2002/05-2018

Dependent variable

$$\boldsymbol{LateFertility}_{\boldsymbol{region,time}} = \frac{ASFR35+_{region,time}}{TFR_{region,time}} * 100$$

Independent variables

GDP in PPS, % women with tertiary education, % women in employment, population density, crude rate of net migration

Econometric framework

We account for the *high degree of spatial autocorrelation* (positive and significant) in late fertility prevalence within spatial models:

1. $\boldsymbol{latefertility} = \boldsymbol{\lambda}\,(\boldsymbol{I_T} \otimes \boldsymbol{W})\,\boldsymbol{latefertility} + \boldsymbol{X}\,\boldsymbol{\beta} + \boldsymbol{\delta} + \boldsymbol{u}$

2. $g\,\boldsymbol{latefertility} = \boldsymbol{\lambda}\,\boldsymbol{W}\,g\boldsymbol{latefertility} + g\,\boldsymbol{X}\,\boldsymbol{\beta} + \boldsymbol{u}$

$\boldsymbol{\lambda}$ **spatial autoregressive parameter**

$\mathbf{X}$ matrix of regressors:
GDP, % women with tertiary education, % women in employment, population density, net migration

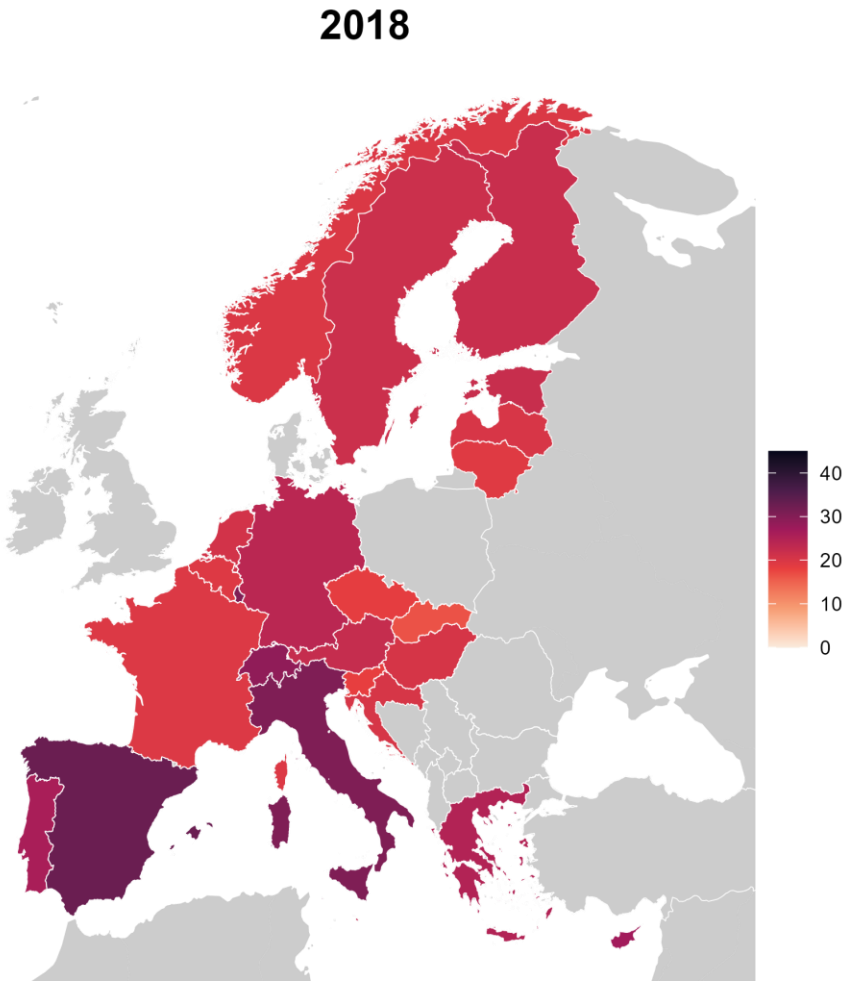
I_T identity matrix $\otimes$ Kronecker product W weights matrix δ random effects

$g = (z^1 - z^0) / z^0 * 100$

Spatial variation of late fertility

Heterogeneity *between* countries

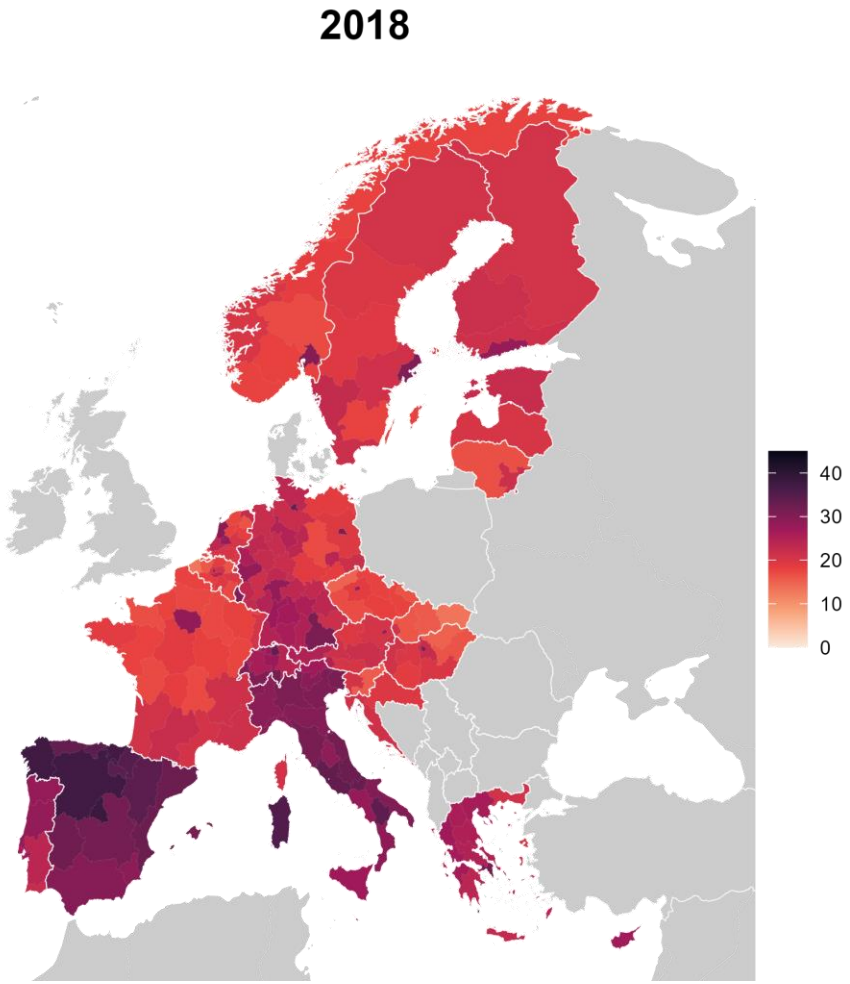
Share of fertility rates at ages 35+ in total fertility (in %), 2018



Spatial variation of late fertility

Heterogeneity *within* countries

Share of fertility rates at ages 35+ in total fertility (in %), 2018

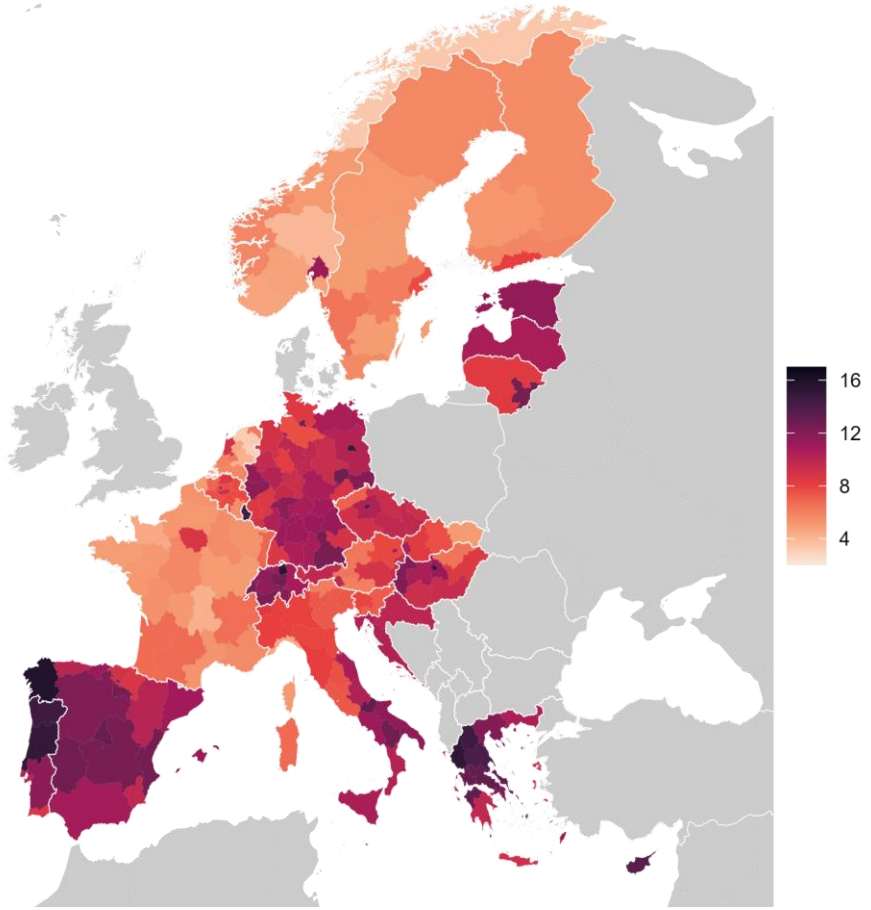


Temporal variation of late fertility

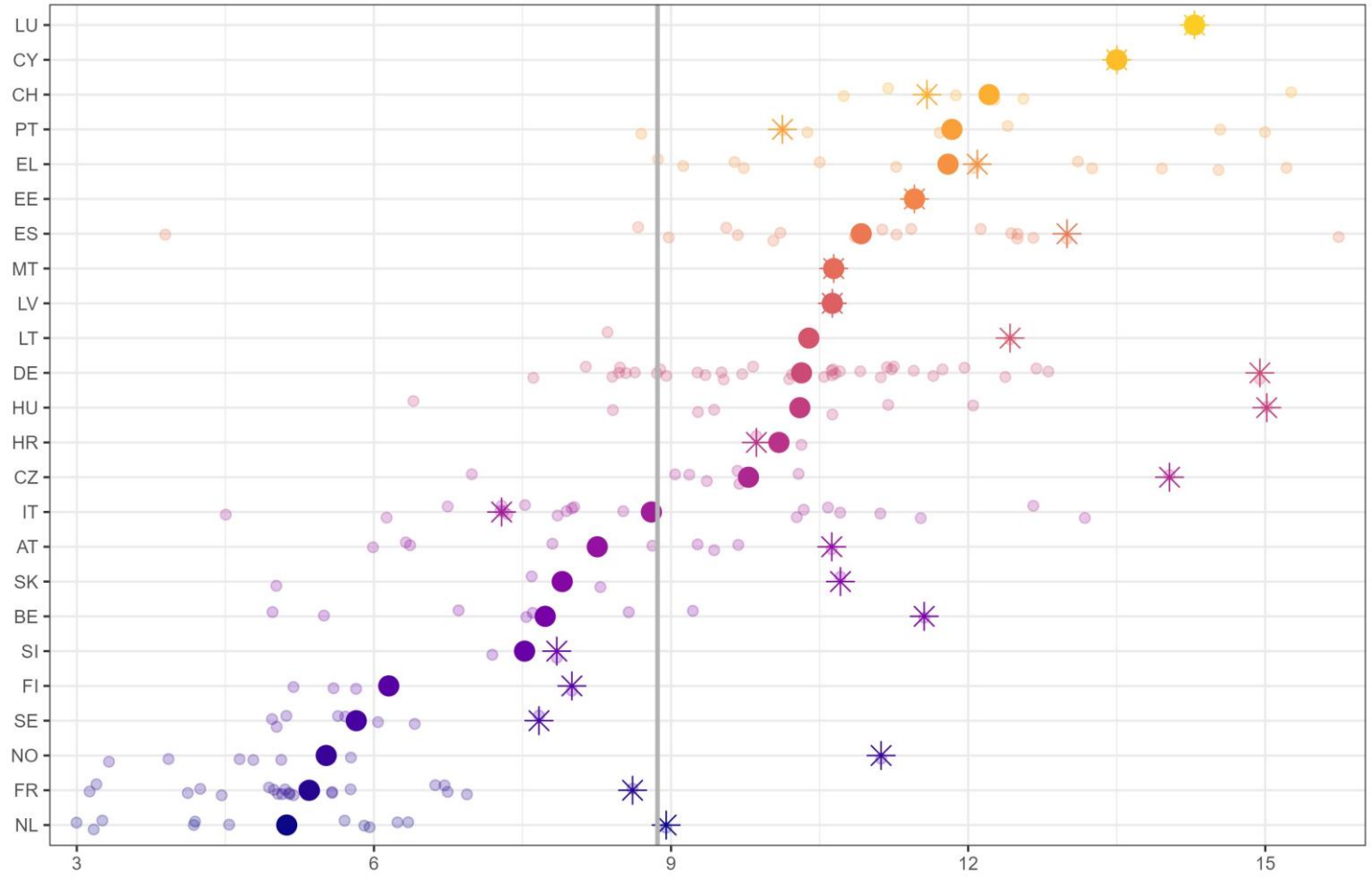
Heterogeneity *over* time

Share of fertility rates at ages 35+
in total fertility (in %),
absolute change (in ppt), 2002-2018

2002-2018



Spatial and temporal variation of late fertility



Absolut change in fertility rates at ages 35+ in total fertility (in %) between 2002 and 2018

Absolute change (in ppt)
2002-2018

Min + 3.0 ppt

Mean +8.9 ppt

Max + 15.7 ppt

● Country mean

✶ Country capital region

ML panel with spatial lag, random effects

Dep. variable: Share of fertility rates at ages 35+ in total fertility

GDP	0.654***
GDP^2	0.139***
% women with higher education	0.620***
% women in employment	0.119
Population density	1.059***
Net migration	-0.080***
λ	0.802***

Contextual factors explain late fertility prevalence

Spatial dependence as well

Note: ***Significant at the 0.1% level, ** 1% level, * 5% level, . at the 10% level.

ML with spatial lag

Dep. variable: Growth in share of fertility rates at ages 35+ in total fertility

g GDP	2.089 *
***g* women with higher education**	**2.386****
g women in employment	-0.622
g population density	-1.708*
g net migration	-0.782
λ	**0.669*****

Contextual factors drive late fertility prevalence

Diffusion as well

Note: ***Significant at the 0.1% level, ** 1% level, * 5% level, . at the 10% level.

Limitations

1. Measures

Period fertility with all parities together

→ Late fertility today: delaying 1st and 2nd births (Beaujouan & Sobotka, 2019)

Spatial dependence as proxy for diffusion

→ Similar work on low fertility patterns (Vitali & Billari, 2015; Wu et. al, 2022)

2. Modifiable areal unit problem (MAUP)

→ NUTS 2 less susceptible to MAUP than NUTS 3 (ESPON, 2006:134)

→ No major discrepancies between units in 2018 (Riederer & Beaujouan, 2023)

Summary

- **Vast spatial *and* temporal variation of late fertility across regions between 2002-2018**
- **Socioeconomic adaption versus geographic diffusion?**
  - *Both* are relevant in explaining regional shifts in late fertility
- **Next steps**
  - Analysis of further contextual factors
  - Enlargement of sample

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