The diffusion of late fertility across European regions

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Contemporary trends

Late fertility is a prevalent trend

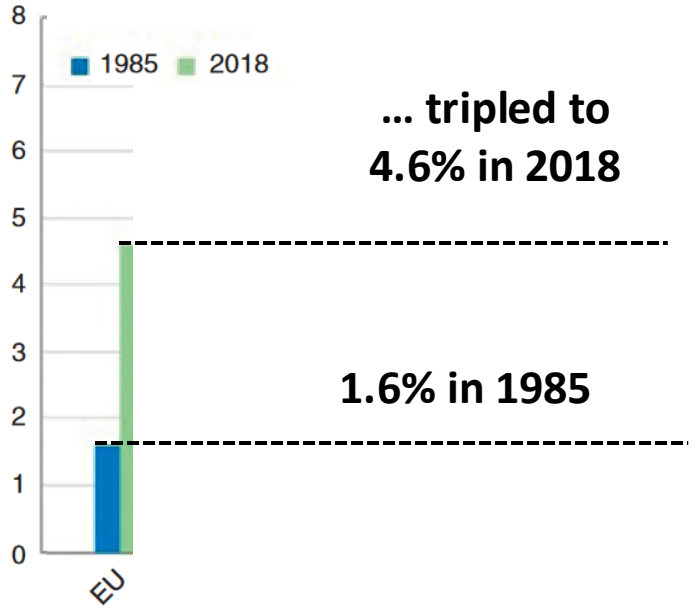
- Increased number of births at advanced reproductive ages
  - 22% of TFR from births at 35+ in Europe in 2018 (Riederer & Beaujouan, 2024)
- Many drivers: extended time in education (Vasireddy et al. 2023), competing activities (Testa 2017), adverse economic conditions and youth unemployment (Skirbekk 2022; Matysiak et al. 2021)

Consequences that span health and socioeconomics realms

- Greater socioeconomic resources (Myrskylä et al., 2017)
- Higher health risks & decreased fecundity (Schmidt et al., 2012; Sauer, 2004)

Late fertility has been on the rise

Share of fertility rates at ages 40+ in total fertility (Beaujouan & Sobotka 2022)



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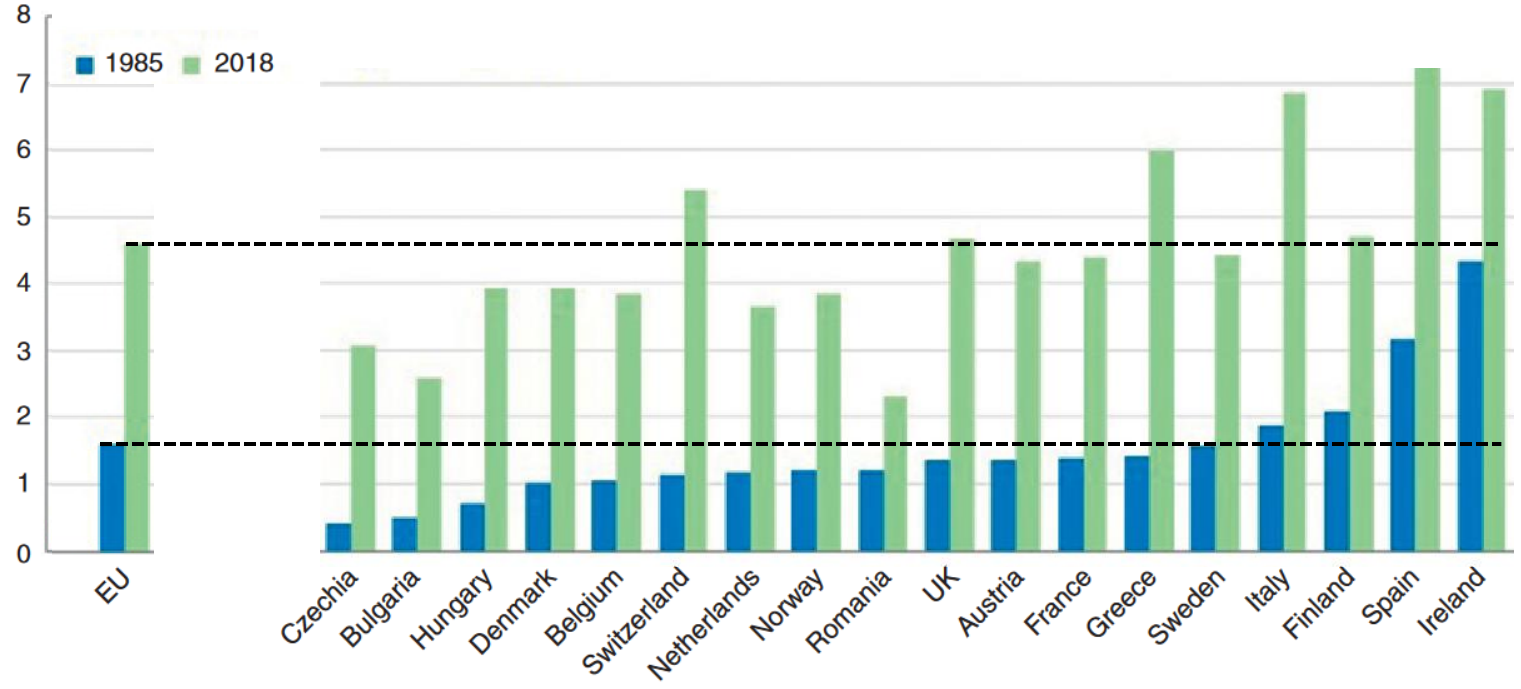
Heterogeneity *between* countries

Share of fertility rates at ages 40+ in total fertility (Beaujouan & Sobotka 2022)



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Heterogeneity *within* countries

Evidence so far

- **Spatial variation**
  - Urban areas exhibit higher prevalence of late fertility (Riederer & Beaujouan, 2024; Buelens, 2021; Campisi et al., 2022; Šprocha & Fitalov, 2022)
- **Temporal variation**
  - MAB increased universally, but at different paces (Buelens, 2021)
- **Contextual factors explain diverse prevalence within countries**
  - Studies emphasize economic (Riederer & Beaujouan, 2024; Šprocha & Fitalov, 2022) and social context (Campisi et al., 2022)

→ **How has late fertility spread across space and time?**

Understanding the geography of spread

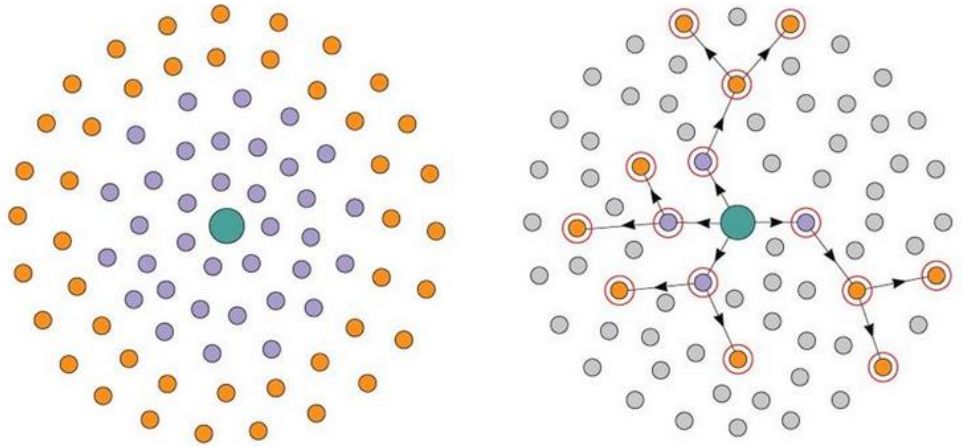
Demographic behaviour may not spread randomly

- **Social influence & learning** at the individual and aggregate level (Bongaarts & Watkins 1996; Costa 2015; Montgomery & Casterline 1996; Rogers 1983)
- **Channels of transmission** include kinship ties, social networks and mass media
  - E.g. trends in one's environment can provide insights into the costs and rewards of childbearing (Balbo and Barban 2014; Bernardi 2003)
  - E.g. positive media portrayal of ART and mothers in their forties may alleviate concerns regarding late childbearing (Lahad and Madsen 2016; Mills, Lavender, and Lavender 2015)
- **Space is, inherently, one key dimension of transmission processes**
  - Hägerstrand (1968) argues that the spread of new phenomena reflects the spatial structure of social networks

Understanding the geography of spread

Patterns of spread

contagious diffusion and **hierarchical diffusion**



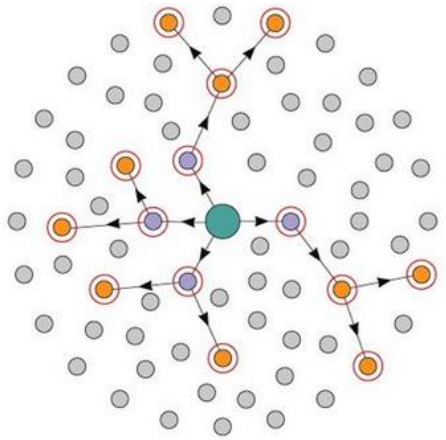
(Morrill, Gaile, & Thrall 2020; Sant-Julien 2007; Figure: twimg)

Understanding the geography of spread

Patterns of spread

Intuition the **behaviour of a region** spreads along **specifically organised** channels of communication, bypassing intermediate locations

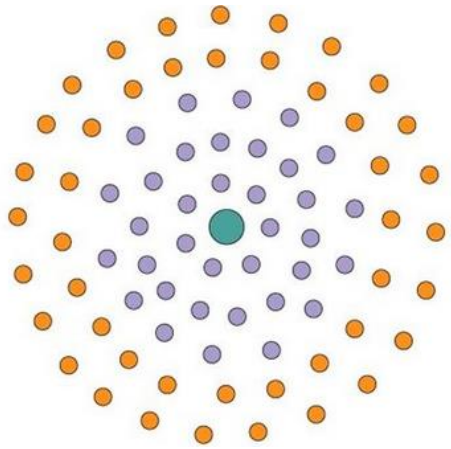
hierarchical diffusion



Understanding the geography of spread

Patterns of spread

contagious diffusion

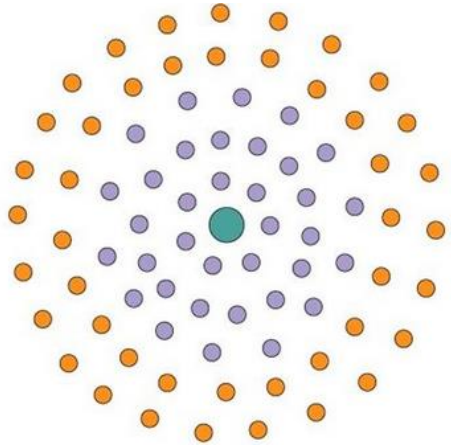


Intuition the **behaviour of a region** spreads along proximity to **neighboring regions**

Understanding the geography of spread

Patterns of spread

contagious diffusion



Verified for family-related behaviour
e.g. historical fertility transitions (Brée & Doignon 2022; Goldstein & Klüsener 2014), contemporary low fertility rates (Vitali & Billari 2017; Wu et al. 2022), and cohabitation behavior (Vitali, Aassve, & Lappegård 2015)

Studies test whether behaviour (*today*) is associated with the behaviour of neighboring regions (*today*)

This paper

- focuses on understanding the geography of the spread in late fertility
- hypothesizes that the spread is driven by proximity (contagious diffusion)

Late childbearing behavior

in a given region in the current period (t)

is influenced by the behaviors observed

in nearby regions earlier (t-1)

This paper

- **focuses on understanding the geography of the spread in late fertility**

- **hypothesizes that the spread is driven by proximity (contagious diffusion)**
  - it acknowledges a temporal lag of diffusion
    today' behaviour is explained by *yesterday's* behaviour
  - it allows for urban influence but is not limited to it

- **exploits regional variation in the rise of the contribution of late fertility rates to total fertility**

- **empirically tests diffusion processes in spatial econometric model**

Data & sources

Macroeconomic data from Eurostat and ESPON

- 193 regions (NUTS 2) in 18 European countries
- 2006-2018

Measure of late fertility

- our baseline threshold refers to 35-49

$$Contribution\ of\ late\ fertility\ rates\ to\ total\ fertility_{i,t} = \frac{\sum_{a=35}^{49} ASFR_{a,i,t}}{TFR_{i,t}} \times 100$$

Contextual socioeconomic factors

- % women in tertiary education, %NEET, GDP, population density

Econometric framework

Dynamic spatial Durbin model (SDM)

$$Y_t = \tau Y_{t-1} + \delta W Y_t + \eta W Y_{t-1} + \mathrm{X_t}\beta + W X_t \theta + \delta + \varepsilon_t$$

Y contribution of late fertility rates to total fertility

X matrix of regressors: women with tertiary education, NEET, GDP, population density

W weights matrix (default connectivity: binary contiguity)

δ fixed effects

Econometric framework

Dynamic spatial Durbin model (SDM)

$$\boldsymbol{Y_t} = \tau Y_{t-1} + \delta W Y_t + \boldsymbol{\eta W Y_{t-1}} + \mathrm{X_t}\beta + W X_t \theta + \delta + \varepsilon_t$$

η represents the spatio-temporal diffusion parameter

Y contribution of late fertility rates to total fertility

X matrix of regressors: women with tertiary education, NEET, GDP, population density

W weights matrix (default connectivity: binary contiguity)

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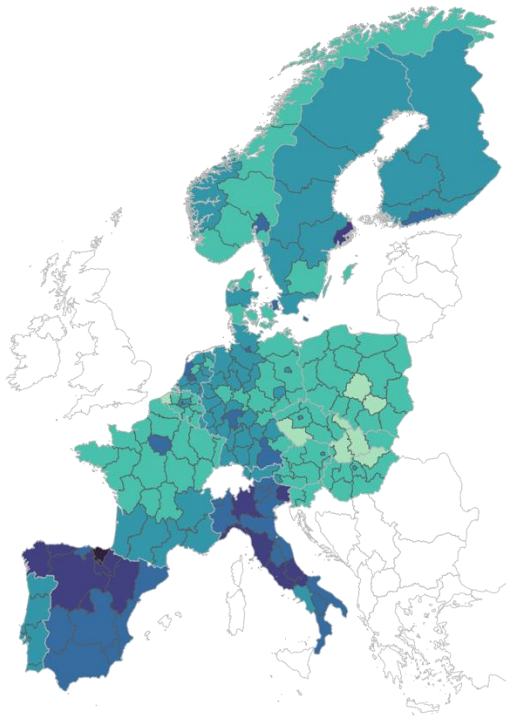
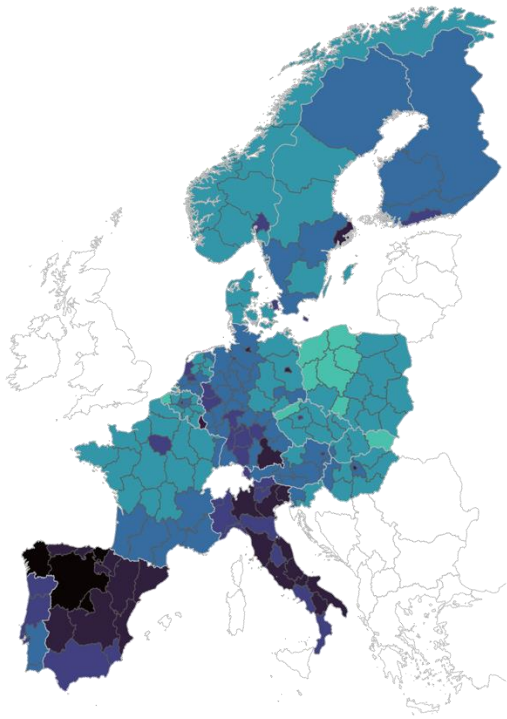
Descriptives I

Mean 16.6
SD 4.9
Min 9.0
Max 30.3

2006

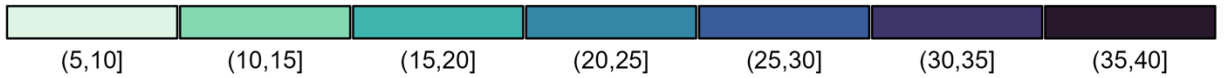


2018



Mean 22.8
SD 6.0
Min 13.1
Max 38.1

Contribution of late fertility (35-49) to total fertility in %



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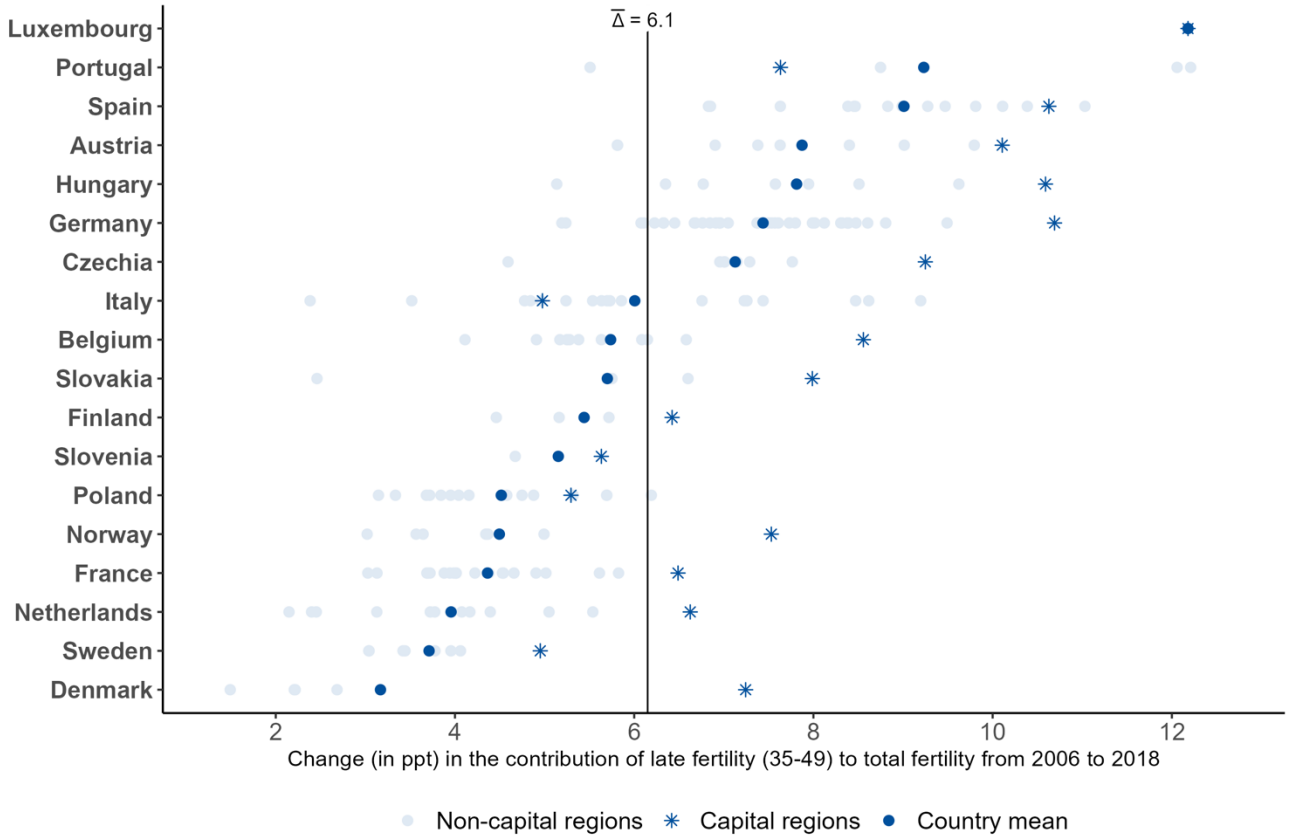
Descriptives II



Significant increases in capital regions

(visualized as ✳)

Main result

Dependent variable Contribution of late fertility rates to total fertility				
	35-49		40-49	
	(1)	(2)	(3)	(4)
WY_t	0.784***	0.343***	0.747***	0.356***
Y_{t-1}		0.454***		0.373***
$\boldsymbol{WY_{t-1}}$		**0.138*** **		**0.249*** **
Women with tertiary education	0.052***	0.033***	0.058***	0.028
NEET	-0.011	0.002	0.019	0.001
GDP	0.271***	0.118***	0.373***	0.191***
Population density	0.402***	0.202**	0.802***	0.466***
WWomen with tertiary education	0.061***	0.010	0.082***	-0.023
WNEET	0.044***	0.005	0.064***	0.020
WGDP	-0.113***	-0.119**	-0.163***	-0.117**
WPopulation density	-1.072***	-0.360	-1.297***	-0.779*
Observations	2,509	2,316	2,509	2,316
W	W^1	W^1	W^1	W^1
Region FE	✓	✓	✓	✓
Dynamic		✓		✓
Log. Likelihood	1768.491	2216.42	605.5419	1004.574
R^2 adjusted	0.781	0.914	0.662	0.848

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Main result

Spatio-temporal diffusion

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Sensitivity to stricter age-threshold

Spatio-temporal diffusion

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Sensitivity to static or dynamic specification

	Dependent variable Contribution of late fertility rates to total fertility				
		35-49		40-49	
		(1)	(2)	(3)	(4)
Static	WY_t	0.784***	0.343***	0.747***	0.356***
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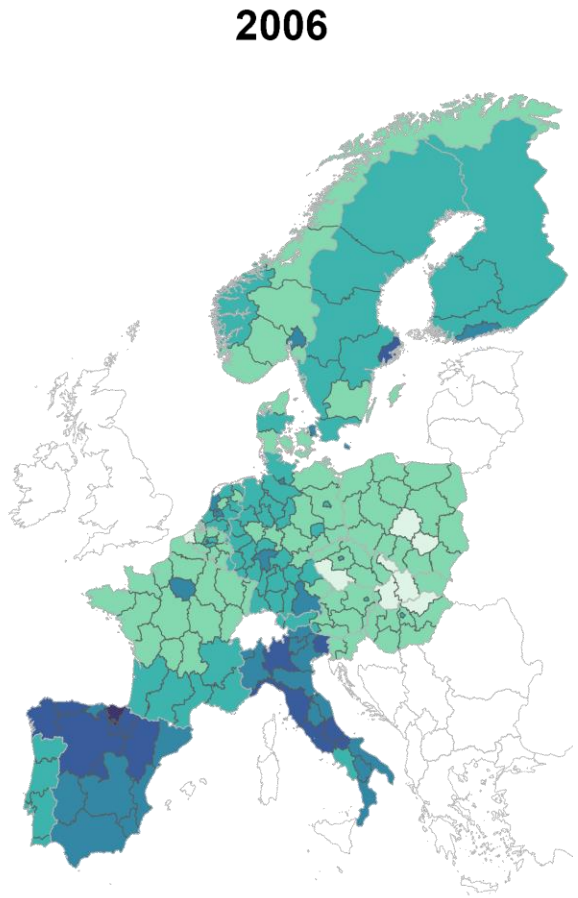
Summary

Our study adds a new dimension to the understanding of late fertility development over time: **the role of geographic processes**

We find

- **Robust evidence of contagious diffusion**
  Late fertility today (t) is influenced by nearby values from yesterday (t-1)

  - Capital regions tend to act as forerunners in this spread
  - Ongoing trend: we observe no plateuing
  - Future trends are likely to be amplified by geographic processes



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