Could the Fertility Transition just be a Communication Process?

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Background and Research Objective

The fertility transition is often viewed in the frameworks of innovation and adjustment (Carlsson 1966):

- **Innovation:** Fertility decline is a result of the diffusion of new knowledge and attitudes to family limitation.
- **Adjustment:** Fertility decline is an adjustment to new social and economic circumstances.

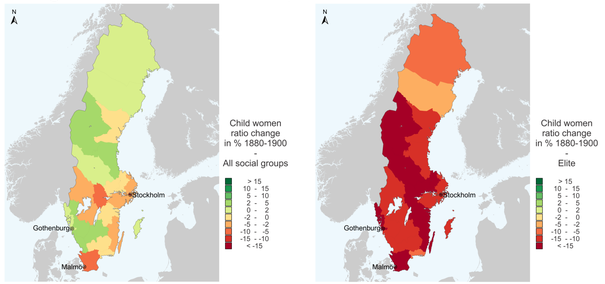
We explore which spatiotemporal characteristics of the decline in different social classes could emerge through innovation-diffusion.

→ We apply **agent-based models** to simulate the fertility decline in Sweden (1880-1900) as an innovation-diffusion process based on simple communication rules.

Observed Fertility Transition in Sweden 1880-1900

Data: Swedish censuses of 1880, 1890, 1900 (100%, individual-level)
Fertility measure: Child woman ratio

Change in child woman ratio in percent 1880-1900



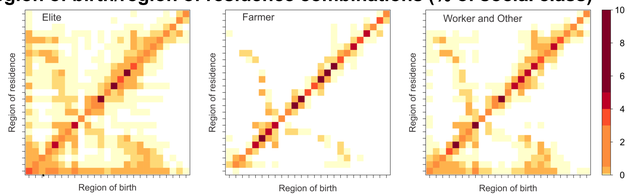
- Elites are forerunners, workers and farmers are lagging behind
- More spatially homogenous decline pattern among the elite than among workers and farmers
- Big cities are forerunners; peripheral north is lagging behind
- Diffusion clusters around big cities (Stockholm, Malmö)

Data and Agent-Based Models

Agents:	10%-sample of the married female population aged 20-49 (with husband present) in the Swedish census 1880 (N=47,195)
3 social classes:	Elite; farmer; worker and other → based on occupation information of the husband
25 regions:	Swedish counties (*län*)

- Adoption of a fertility controlling behavior is modeled as an irreversible process. Agents can only move from status *not adopted* to *adopted*.
- Agents do not age or migrate
- Risk of adoption depends on number of adopted agents of the same social class in region of residence & region of birth (to which agents might still have social links) → **Migration links** are used as proxies for **communication links** (Hägerstrand 1965, Rosero-Bixby & Casterline 1994):

Region of birth/region of residence combinations (% of social class)



- Three communication mechanism are considered: *social adaptation*, *social influence*, *social learning*. All produce very similar outcomes.
  → We restrict ourselves here to our **social adaptation** algorithm:

$$RA_{c,t} = \frac{SR_{c,t} * w + SB_{c,t} * (1 - w)}{100} * x$$

RA: Risk that a non-adopted agent of a social class c adopts in time period t (whether agent adopts is determined by Monte Carlo simulation)
SR/SB: Share adopted in social class c in region of residence/region of birth at time t (0-100%)
w: Weight given to effect of share adopted in region of residence vs. region of birth (0-1)
x: Maximum risk of adoption, if all agents have adopted (0-100%)

Three starting scenarios:

- Random start within Sweden
- Ideational diffusion from countries which already entered the transition (at that time only France and Belgium) through migration links to these countries
- Diffusion from big cities (mix of diffusion and adjustment aspects as we assume decline to start in cities due to high adaptation pressure)

Outcomes

Reproduced characteristics by starting scenario

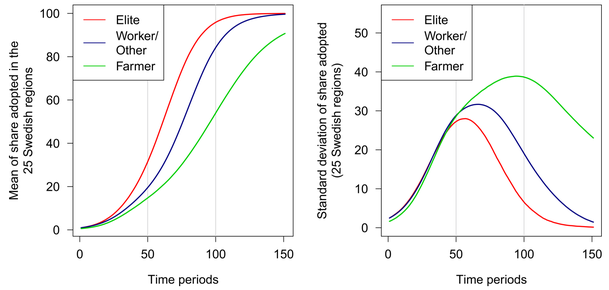
	Random Start	Diffusion from early decline countries	Diffusion from big cities
Elite forerunner	Not consistently	Yes	Yes
Elite more homogenous decline pattern	Not consistently	Yes	Yes
Cities forerunners	Not consistently	Yes	(Inherent of scenario)
North lagging behind	Not consistently	Yes	Yes
Diffusion clusters around early centers	Not consistently	Yes	Yes

No robust findings are obtained for the random-start scenario. But this does not contradict our considerations, as we do not expect the fertility decline to have started out of randomness in Sweden.

Example: **Diffusion from big cities scenario**

At start, 10% of each social class in Stockholm city, and 5% of each social class in Stockholm, Gothenburg and Malmö regions have already adopted (*social adaptation*, w= 0.7, x=10, average of 100 simulations):

Diffusion in social classes across regions



Discussion and Conclusion

Agent-based models allow us to reproduce with simple communication rules major spatiotemporal characteristics of the fertility transition in Sweden.

So is it all about communication?
…probably not as communication links reflect:
- spatial variation in economic development
- nation-building processes
- spatial variation in social norms

But:
Even in a static society with no structural adaptation pressure, a fertility transition with its typical spatiotemporal characteristics could unfold due to ideational diffusion along communication pathways.

Implications:
Our findings support the view that innovation-diffusion is potentially an important factor in the fertility transition. This is relevant for prospects of fertility transitions in less developed societies in Africa.

Findings are also relevant for research aiming to identify causal determinants of the transition with econometric models:
→ Spatiotemporal aspects of the transition do not necessarily stem from variation in structural factors, but can also stem from variation in communication links.

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