A Spatial Analysis of Childbearing in Cohabitation

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Abstract

The disconnection between marriage and childbearing represents one of the main recent change in the families, with the Nordic countries acting as the forerunners in this new trend. In this paper we study the diffusion of childbearing in cohabitation as opposed to marriage across Norwegian municipalities. We rely on spatial panel econometrics to investigate how childbearing in cohabitation spreads geographically in relation to three indicators: importance of religion, female educational expansion and economic uncertainty. Our findings indicate that female educational expansion is the most important predictor of childbearing in cohabitation. This means that the diffusion of childbearing in cohabitation mirrors the diffusion of female educational expansion and is driven by it. The innovation of this paper is found in the access to unique data which offer detailed information on all municipalities within a country. Using new advanced modeling techniques this paper provides new and improved knowledge about the diffusion of childbearing in cohabitation.

1. Introduction

The most dramatic change in the families is the disconnection between marriage and childbearing. Family formation used to be related to a certain sequence of events including marriage as the main arena for childbearing while we now observe more children born within cohabitation (Perelli-Harris et al. 2012). The Nordic countries have been the forerunners in this new trend and the proportion of non-marital births started to increase already in the 1970s. Today, the majority of children in the Nordic countries are born within non-marital cohabitation. According to the theoretical framework underlying the Second Demographic Transition (Surkyn and Lesthaeghe 2004), developed countries have undergone unprecedented changes in lifestyle choices related to ideational and value change which led to new mechanisms of family formation over the past decades. These changes occurred at different times and with different pace across countries and regions, and have been measured by the so-called Second Demographic indicators, i.e. non-marital cohabitation and fertility, childlessness, fertility postponement, divorce, abortion. Childbearing in cohabitation, the object of study in this paper, has also

been described as a Second Demographic indicator. As such, it represents a "new" demographic behavior leading to the emergence of a new family type which was absent or very rare in the past.

New family behaviors do not occur randomly in space and time, but are spread among people via social networks and kinships which over time result in different demographic outcomes observable at the macro level (Cleland and Wilson 1987; Montgomery and Casterline 1993; Casterline 2001). As the Princeton European Fertility Project has shown, the fertility decline observed in the eighteenth and nineteenth century resulted from the diffusion of new attitudes and behaviors across several European provinces sharing similar cultural characteristics (Coale and Watkins 1986; Bongaarts and Watkins 1996). So far the documentation and explanation of spatial patterns observed in demographic behaviors have been rare, and prevalently related to the fertility decline during the First Demographic Transition in different regions of the world (Tolnay 1995; Van Bavel 2004), or the current fertility decline characterizing developing countries (Watkins 1987; Weeks et al. 2000; Potter et al. 2010). There are some exceptions (see e.g. Sparks and Sparks 2010 on mortality rates). In particular, the Second Demographic Transition framework has provided descriptive evidence that the Second Demographic indicators, secularization and political identity are all characterized by spatial patterns in several European countries (Lesthaeghe and Neels 2002; Valkonen et al. 2008; Lesthaeghe and Lopez-Gay 2013), and in the United States (Lesthaeghe and Neidert 2006).

The recent availability of geographically referenced data and new econometric techniques offer an opportunity to bring space back in when studying demographic behaviors, as recently suggested by scholars (e.g. Boyle 2003; Voss 2007).

This calls for new and advanced analyses about the diffusion of childbearing in cohabitation.

Albeit its population is not large compared to other countries, Norway makes an interesting case in the study of diffusion of innovations as it is a country with one of the highest proportion of childbearing in cohabitation nowadays. Also, together with the other Scandinavian countries, Norway is one of the forerunners in the adoption of new family behaviors, among which childbearing in cohabitation. Understanding the dynamics and the diffusion of new demographic behaviors in this setting might therefore help to predict how these behaviors will spread across other countries.

In this paper we adopt a spatial perspective to investigate how childbearing in cohabitation spreads geographically using detailed information on all municipalities in Norway for the period 1987-2011 and spatial panel econometrics techniques. We document a certain heterogeneity in childbearing in cohabitation within Norway and the existence of spatial patterns. If descriptive results show that municipalities with high first childbearing in cohabitation rates tend to cluster together in space, spatial panel estimates suggest that these spatial clustering remains significant even after controlling for structural factors.

2. Theoretical assumptions

The idea is that childbearing in cohabitation spreads in areas with shared characteristics in other respects. The spread of new ideas and knowledge is dynamic and results from a social influence mechanism or a social learning process at the individual level. Kinships, social networks and the mass media are the main vehicles for the spread of new behaviours. Over time, this process results in a diffusion mechanism across space, leading to collective outcomes at the population level. In lack of data on complete networks of individuals across the national territory and over a long time period, to study the diffusion of a new contemporary fertility behavior, we rely on the lowest territorial aggregation for which data on childbearing in cohabitation is available, i.e. the municipality. The spatial diffusion of childbearing in cohabitation is studied in relation to four different aspects that we believe may influence the diffusion of childbearing in cohabitation.

The first factor is importance of religion. Historically there is a strong link between religion and marriage, and the secularization of societies has been linked to the increasing disconnection between marriage and childbearing. We expect the prevalence and the diffusion of childbearing in cohabitation to be smaller in municipalities where religion has more importance. The second factor is female educational expansion. We expect a positive relationship between this indicator and childbearing in

cohabitation. In a traditional male breadwinner –female carer society, women were more economically dependent on their spouses than in societies where dual-earner–dual-carer families have emerged. In areas where women achieved high levels of education, childbearing within marriage might be less important for women's economic security. The third factor is women's empowerment in the public sphere. We expect childbearing in cohabitation to be more prevalent in municipalities where women are highly represented in the public sphere. The last factor is economic uncertainty. An explanation referred to as the "pattern of disadvantage" has been used as an alternative explanation for increasing childbearing in cohabitation across Europe (Perelli-Harris el. al 2010). Across Europe, life has become more uncertain in the labor and housing markets. Young people have responded to these conditions by postponing family-related events including leaving the parental home, marrying and childbearing (Kohler et al. 2002; Sobotka and Toulemon 2008). In uncertain times young people may respond to this by choosing the temporary and reversible nature of cohabitation which has provided an alternative to the commitments of marriage (Perelli-Harris el. al 2010). Based on this theoretical argument, we can expect the prevalence of childbearing in cohabitation to be higher in municipalities with high economic uncertainty. However, the economic situation in Norway cannot be compared to the situation in many other European countries and the Nordic welfare state provides a security net which ensures an economic certainty to all citizen.

3. Data

Statistics Norway provides municipal-level annual information about first births by marital status of the mother, starting in 1987. This allows us to compute a measure of first childbearing in cohabitation, our dependent variable, which is essentially the proportion of first births occurred to (unmarried) cohabiting mothers on the total number of first births occurred to married or cohabiting mothers. The access to this unique source of data offers detailed information on all Norwegian municipalities during the period 1987-2010. In order to catch the whole transition period covering the introduction of the new family behavior measured by childbearing in cohabitation we would need a longer time series going far back in time. In the mid-80s, in fact, non-marital childbearing as well as other Second Demographic Transition indicators were already quite widespread Norway. In subsequent analyses, we will therefore look at an intermediate stage in the process of diffusion of childbearing in cohabitation, while we leave apart the pre-transitional and initial periods because of lack of municipal-level data

In the following we describe the independent variables which will be used in subsequent analyses. In order to measure importance of religion, we use the proportion of representatives from the Norwegian Christian Democratic Party (KrF) in the municipal council. This is a political party that represents strong religious values and high support for this party can be used as a proxy for strong importance of religion in a municipality. Measuring importance of religion via e.g. religious denomination, might be misleading in a country like Norway which is often described as a secularized country, despite almost 80% of the population belongs to the state church. Female educational expansion is measured by the proportion of women aged 16 and above with higher educational level achieved. Women's empowerment in the public sphere is measured by the proportion of female municipal council representatives on the total representatives. Finally, economic uncertainly is measured by the unemployment rate for men.

Two years (2000 and 2001) are excluded from our time series because data on first births by living arrangements of the mother were incorrectly imputed for these two years among single and cohabiting mothers, therefore our variable of interest, first childbearing in cohabitation vs. marriage could not be computed correctly.

4. Methods

Spatial modeling allows for the introduction into regression models of spatial interactions among neighboring observations in space. In the first place, spatial models allows the estimation of unbiased

results in cases where the data show spatial dependence. In other words, whenever the unit of analysis, in this case the municipality, shows regional variation with neighboring units showing similar values of the dependent variable (or of independent variables), traditional regression models fail to correctly estimate the model parameters because one of the main assumptions of traditional regression, i.e. that the units of analysis are independent, is in this case violated as they are indeed (spatially) dependent. In this approach, neighboring areas are recognized as having more importance than areas that are far apart, hereby incorporating the idea which is proper of the diffusionist perspective discussed in Section 1. In particular, spatial panel methodologies represent a prominent tool to analyze the spatial and temporal dimensions simultaneously (Anselin et al. 2008; Elhorst 2010). In studying diffusion mechanisms underlying the emergence and spread of new demographic behaviors, as in the case of first childbearing in cohabitation, this set of models can effectively provide an estimate of the magnitude and significance of diffusion, while controlling for exogenous influences (Casterline 2001).

The fixed effects spatial lag panel model that we employ in this paper can be formally described as follows:

$$y_{it} = \rho \sum_{j=1}^{N} w_{ij}\, y_{it} + \boldsymbol{x_{ij}}\, \boldsymbol{\beta} + \mu_i + \varepsilon_{it}, \qquad i,j = 1,\ldots,N; \qquad t = 1,\ldots,T.$$

The spatial lag model represents a diffusive process in the dependent variable, i.e. the proportion of childbearing in cohabitation versus childbearing in marriage in a given municipality and year (for regression analyses, due to data limitation, we refer to the period 1988-2011). The spatial autocorrelation coefficient ρ captures the diffusion of childbearing in cohabitation among municipalities over time, while controlling for other confounders. The summation term represents the spatial lag of the dependent variable, with w_{ij} equal to the weight assigned to province j. Spatial weights incorporates the neighbouring structure of municipalities (i.e. whether two municipalities are neighbours or not), are specified as follows:

$$w_{ij} = \begin{cases} 1/\eta_i & \text{if } j \in N_k(i) \\ 0 & \text{otherwise} \end{cases}$$

where $N_k(i)$ defines the k-nearest neighbours to the spatial unit i and η_i is the number of neighbours to spatial unit i, and it is assumed that a unit cannot be its own neighbour i.e. $w_{ii} = 0$. Neighbours are identified on the basis of the the euclidean distance between the centroids of each municipality, we selceted k=3 (i.e. 3-nearest neighbours). Finally, μ_i denotes municipal fixed effects, meant to control for all fixed (i.e. time invariant) municipal-specific characteristics. In addition to the three indicators discussed in Section 3 (male unemployment rate, importance of religion and female educational expansion), we also control for the number of inhabitants.

5. Results

5.1 Childbearing in Cohabitation in Norway

Norway is frequently described as a forerunners in the adoption of new family models and lifestyle choices described in the context of the Second Demographic transition. In the late 80s out-of-wedlock births were already widespread in Norway, to the point that the majority of first births occurred outside of marriage (about 55%). Back in 1987, first births within marriage accounted for 46% of the total first births, while first births within non-marital cohabitation and first births to single mothers accounted for 32% and 22%, respectively. Starting from the early 90s, childbearing in cohabitation had already

outpaced childbearing within marriage (42% versus 38% in 1990). By the mid-90s the proportion of first births occurred to cohabiting mothers accounted for more than half of the total first births (51% in 1995), and it has remained fairly stable until the late 2000s (54% in 2011), while first births to single mothers have remained stable over the whole period around 22%. In this paper we are interested in comparing first childbearing in cohabitation vs. marriage, leaving apart first births occurred to single mothers, which also represent an indicator of new family models, but which deserves a separate investigation as it also embraces different aspects (e.g. teenage pregnancy, etc.) which are beyond the object of this study. Childbearing in cohabitation versus marriage rapidly increased from 42% in 1987 to 53% in 1990 and rose to reach 68% by the late 2000s.

[Table 1 about here]

This brief introduction about childbearing behaviors in Norway refer to national averages. If it is a common belief that Norway and the other Scandinavian countries represent a homogeneous population with similar fertility behaviors and similar attitudes, in reality there is extensive regional variation. By simply plotting our indicator of first childbearing in cohabitation versus marriage on a map, we observe that municipalities with high childbearing in cohabitation rates are not randomly scattered across the country, rather, childbearing in cohabitation is diffusing across space and over time, meaning that we are able to observe clusters of neighboring municipalities sharing high (low) rates of first childbearing in cohabitation. Figure 1 maps childbearing in cohabitation versus marriage in five periods: 1987-1990, 1991-1995, 1996-2000, 2001-2004, 2005-2010 (data are aggregated over 5-year periods to avoid eventual biases due to the small size characterizing some Norwegian municipalities). Similarly to what happens during an epidemic contagion, childbearing in cohabitation rates spreads over time across neighboring municipalities. In the late 80s, the forerunner municipalities in terms of childbearing in cohabitation were located in the Northern part of the country, while the South was characterized by a low prevalence of childbearing in cohabitation, with childbearing in cohabitation representing less than half of the births in some clusters, and even less than one fourth in others. Figure 1 clearly shows that over time, more and more municipalities registered a proportion of childbearing in cohabitation versus marriage above 50% of the total births. Through the late 2000s, most municipalities in the South gradually moved towards the national level of childbearing in cohabitation.

[Figure 1 about here]

5.2 Diffusion of Childbearing in Cohabitation over time

The existence of spatial autocorrelation in childbearing in cohabitation across municipalities is established through the computation of the Moran's *I* index (Table 1), which, for all years considered, yields a statistically significant spatial autocorrelation. Spatial autocorrelation is equal to 60% in the late 80s and it declined over time to reach 10% in the late 2000s. The fact that the Moran's *I* coefficient declines over time is coherent with the innovation-diffusion perspective. Childbearing in cohabitation, i.e. an innovation which used to be very rare in the past, starts to emerge at some point in time. But this of course does not happen homogeneously across the country. Rather, the phenomenon is restricted to selected clusters of innovative municipalities in the Centre and North. Hence, in the late 80s the heterogeneity across municipalities in the country was high, meaning that areas where childbearing in cohabitation was already widespread, coexisted with areas where it was extremely rare. In other words, spatial autocorrelation decreases as childbearing in cohabitation is adopted by more and more municipalities, coherently with what established by the literature on the timing of demographic transitions (Lesthaeghe and Vanderhoeft 2001; Lesthaeghe and Neels 2002).

[Table 2 about here]

Results from the spatial panel model over the period 1988-2011 show that importance of religion, economic uncertainty, women's empowerment in the public sphere and size of the municipality are

associated with childbearing in cohabitation, at the municipal level (Model 1 in Table 3). Also, spatial autocorrelation in first childbearing in cohabitation is estimated at 0.38, meaning that the spatial pattern of first childbearing in cohabitation we observed in Figure 1 is preserved even after controlling for the above-mentioned factors.

However, when the variable measuring female educational expansion is included in the model, the spatial autocorrelation coefficient, while remaining statistically significant, is reduced from 0.38 to 0.26, and the other control variables loose significance (cf. Model 1 and Model 2 in Table 3). Hence, female educational expansion is the most important predictor for childbearing in cohabitation. Municipalities where on average women are highly educated, tend to have a high childbearing in cohabitation versus marriage. Also, this means that female educational expansion is able to explain a significant part of the diffusion in childbearing in cohabitation. In other words, our results indicate that the diffusion of childbearing in cohabitation mirrors the diffusion of female educational expansion and is driven by it. The other factors are blurred when they compete with female educational expansion.

In a next step, we compute the same multivariate exercise on three different sub-periods, 1988-1994, 1995-2003 and 2004-2011. As childbearing in cohabitation was spreading across the country during the last 20 years, the analysis by periods helps to evaluate if and how the correlations between our variables of interest and first childbearing in cohabitation changed over time. From results presented in Table 4 we learn that female educational expansion was the most important predictor only for the first time period. Until the mid-90s, when childbearing in cohabitation was still rare in some parts of the country, first childbirth in cohabitation was more prevalent with respect to first childbirth within marriage in those places where women were highly educated. At the same time, economic uncertainty was positively associated with childbearing in cohabitation, meaning that in those places where men were facing a high unemployment rate, it childbearing in cohabitation was more prevalent than childbearing within marriage. Over time, however, these associations changed. From the mid-90s, childbearing in cohabitation became unrelated to women's educational attainment. If forerunners in the adoption of this new family behavior were municipalities where women, on average, had a high educational attainment, over time, childbearing in cohabitation became an option for all women, independently of their educational level. On the other hand, the association between childbearing in cohabitation and economic uncertainly became negative

6. Conclusion

Childbearing in cohabitation is today the most widespread reproductive model in Norway and the other Scandinavian countries and it starts to involve a non-negligible number of newborns in many other advanced societies. Childbearing in cohabitation is here conceived as an innovative demographic behavior. It is innovative because historically the normative reproductive behavior implied childbearing to be constrained within marriage, while today more and more couples decide to have children without being married.

Results in this paper serve as an empirical confirmation of the innovation-diffusion theory which was first developed to explain the First Demographic Transition.

We acknowledge that results presented in this paper refer to data aggregated at the municipal level and therefore, because of the ecological fallacy problem, they need not mirror those at the individual level.

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Tables and Figures

Table 1: Proportion of first births by living arrangements of the mother and proportion of first births in cohabitation versus marriage (dependent variable) across Norwegian municipalities, 1987-2011

year	%Married	%Cohabiting	%Single	%Cohabiting VS Married
1987	46.17%	31.79%	22.04%	42.01%
1988	43.61%	33.44%	22.95%	44.62%
1989	40.30%	36.60%	23.10%	48.64%
1990	37.53%	41.77%	20.69%	53.29%
1991	35.73%	42.80%	21.46%	54.74%
1992	32.50%	45.07%	22.43%	58.95%
1993	31.53%	47.87%	20.60%	60.44%
1994	32.68%	48.11%	19.22%	59.82%
1995	29.98%	50.50%	19.52%	62.95%
1996	29.80%	52.04%	18.16%	63.65%
1997	29.12%	53.24%	17.64%	65.01%
1998	29.26%	54.12%	16.62%	65.20%
1999	29.46%	52.83%	17.71%	64.42%
2000				
2001				
2002	27.83%	50.98%	21.18%	64.59%
2003	28.73%	50.77%	20.50%	63.73%
2004	28.10%	53.12%	18.78%	65.36%
2005	25.70%	52.89%	21.42%	67.07%
2006	24.71%	54.25%	21.04%	68.39%
2007	26.08%	52.89%	21.03%	67.14%
2008	23.88%	51.31%	24.81%	68.57%
2009	23.88%	52.87%	23.25%	68.57%
2010	25.68%	52.53%	21.78%	67.31%
2011	24.65%	53.71%	21.64%	67.92%

Table 2: Moran's *I* coefficient of spatial autocorrelation across Norwegian municipalities, 1987-2011

year	Moran's *I*	year	Moran's *I*
1987	0.60	2000	0.23
1988	0.46	2001	-
1989	0.42	2002	-
1990	0.45	2003	0.16
1991	0.42	2004	0.14
1992	0.41	2005	0.19
1993	0.38	2006	0.26
1994	0.33	2007	0.15
1995	0.35	2008	0.20
1996	0.33	2009	0.09
1997	0.32	2010	0.10
1998	0.32	2011	0.11
1999	0.29		

Table 3: First Childbearing in Cohabitation vs. Marriage: Results from Spatial Panel Models, 1988-2011

	Model 1		Model 2	
	Coeff.	s.e.	Coeff.	s.e.
ρ	0.382***	(0.018)	0.260***	(0.020)
Male Unemployment	-1.150***	(0.142)	-0.154	(0.152)
Importance of Religiosity	-0.163**	(0.057)	0.034	(0.058)
N. inhabitants	0.184***	(0.048)	0.031	(0.049)
Female Mun. Council Repr.	0.133***	(0.023)	0.011	(0.024)
Female Educational Expansion			0.798***	(0.049)

p-value: 0 '***' 0.001 '**' 0.01 '*' 0.05

Note: Years 2000 and 2001 are excluded from the time series because data on first births by living arrangements of the mother.

Table 4: First Childbearing in Cohabitation vs. Marriage: Results from Spatial Panel Models, Separate Time Periods: 1988-1994, 1995-2003, 2004-2011

	1988-1994		**1995-2003**		**2004-2011**	
	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.
ρ	0.139***	(0.037)	-0.015	(0.041)	0.045	(0.037)
Male Unemployment	1.493***	(0.287)	-0.774*	(0.303)	-1.117**	(0.351)
Importance of Religiosity	0.202	(0.160)	-0.022	(0.110)	0.029	(0.129)
N. inhabitants	-0.018	(0.119)	0.060	(0.367)	0.105	(0.197)
Female Mun. Council Repr.	-0.064	(0.056)	0.033	(0.050)	0.085	(0.047)
Female Educational Expansion	2.214***	(0.236)	0.101	(0.171)	0.041	(0.165)

p-value: 0 '***' 0.001 '**' 0.01 '*' 0.05

Note: Years 2000 and 2001 are excluded from the time series because data on first births by living arrangements of the mother.

Figure 1: Proportion of Childbearing in Cohabitation versus Childbearing in Marriage