The onset of out-of-wedlock births in Switzerland
A spatial diffusion analysis

Jean-Marie Le Goff
Center for Life Course and Inequalities research
University of Lausanne

Jean-Marie Le Goff@unil.ch

The aim of the communication is to investigate the onset of out-of-wedlock births in the Swiss territory. The level of non-marital births is slowly increasing in Switzerland, starting from 3.8% in 1970, reaching 4.8% in 1980, 6.1% in 1990 and 10.7% in 2000 and 17.9% in 2009. However, it is interesting to note that the starting time of the spread of extra-marital birth differed according to regions (Wanner & Fei, 2004). It has, for example, first increased in the French speaking area of Switzerland and in urbanized areas. We expect that this onset follows a chain of spatial diffusion along the different areas and regions.

Data and methods

Data we used were published by Wanner & Fei (2004) and represent the average proportion of out-of-wedlock births for the period 1969-1972, 1979-1982, 1989-1992 and 1999-2002 for each district of Switzerland. For simplicity, we will denote these fours periods by 1970, 1980, 1990 and 2000. In the context of Switzerland, the district corresponds to a territorial unit between the level of the commune and the level of the canton. The number of districts was during this period of 184, but for three of them we do not have data. In order to analyse the process of diffusion of the onset of extra-marital births across districts, we conduct two methods of analysis.

1) The first approach is inspired by Bocquet-Appel & Jakobi (1998) and consists to determine when began the spread of extra-marital unions in each district. This method is based on the calculation of the relative difference D_{0t} in extra-marital births in a district between the first period *0* of measurement (1970) and each other period of measurement, symbolised by *t*.

$$D_{0,t} = \frac{NB_{i,t} - NB_{i,0}}{NB_{i,0}}$$

Where $NB_{i,t}$ is the proportion of extra-marital births in the district *i* at time *t*. The date of the onset of out-of-wedlock in the district *i* is then defined by the interperiod during which the relative difference exceeds a threshold *l*. This threshold is computed as the ninth decile of the relative difference computed for each district in the first interperiod between 1970 and 1980. The 10% of district for which the relative difference is over *l* between these two dates (and always greater to it in subsequent interperiods) are considered to be precursors in the spread of extra-marital births. If *l* is not reached in 2000 by a district, it is considered that the process of increase of extra-marital births did not start in this district.

2) We estimate an event history model in which the hazard rate of the onset time of out-of-wedlock birth is a function of: a) characteristics of district *i* (like the dominant religion, the dominant vote in federal elections, etc.); b) the distance between districts which have already begin their process of extra-marital births spreading and each district *i* submitted to the risk of an onset (Hedström, 1994, Montgomery & Casterlline, 1996, Palloni, 2001,). The estimated model is a time discrete hazard model with the log-log complementary link (Le Goff, 2011).

$$\log\left[\log(1-P_i(t)\right] = \alpha_t + \beta_t x_{i,t} + \delta_i \sum_{1}^{n} w_{ij,t} W_{j,t-10}$$

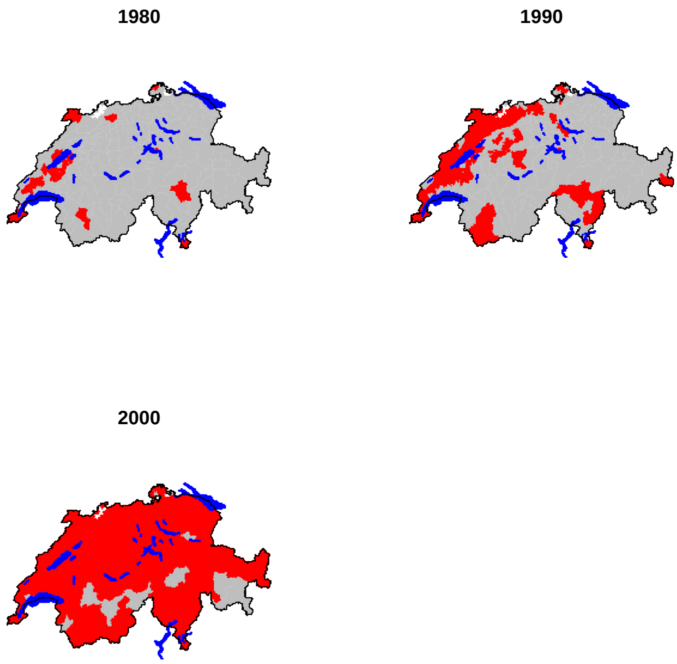
Where $P_i(t)$ is the conditional probability for the district *i* to start the spread of extra-marital birth during the period *t-10* years and *t*; α_t, is an intercept to be estimated for each period *t-10*, *t*; $x_{i,t}$ represents a set of characteristics associated to the district *i* and β_t are coefficients related to the effect of characteristics on the transition, to be estimated; $W_{j,t-10}$ is a binary variable indicating for each district *j* (different of *i*) if the spread of extra-marital already starts in it ($W_{j,t-10}=1$) or no ($W_{j,t-10}=0$); $w_{ij,t}$ is a weight which can be related to a distance between the two districts *i* and *j*, eventually time varying while δ_t is the coefficient of diffusion to be estimated. Higher is the distance between two districts and lower is $w_{ij,t}$

In the present case, the distance is not a geographic distance separating two districts. This kind of distance suppose that the nearest is a district *j* in which the process of diffusion already began from a district *i* in which the process did not begin, the more *j* will have influence on *i*. This does not seem to be accordance with the geographical and social specificities of Switzerland. As the country is very mountainous, two neighbouring districts cannot necessarily easily be reached one from the other. Moreover, there are not a lot of exchanges between the different speaking areas. We choose another weigth which is based on the mobility between districts. In each census between 1970 and 2000, people were asked where they lived five years before the date of the census. We can then use as weight $w_{ij,t}$ the number of people who were living in the district *j* in *t-5* but were living in the district *i* at the time *t*. This number does not mean that all these people will diffuse in the district *j* the idea of extra-marital birth, but it only indicates the nearness between the two districts. The higher is this number and the higher are the districts proximate one from the other.

Results.

Figure 1 shows maps for each period distinguishing districts in which the diffusion of extra-marital began (in red) from districts in which it did not begin (in grey). Districts in which the process of diffusion began during the period 1970-1980 are mainly situated in the French speaking part of Switzerland. In this region, the process starts in the urbanised district of Geneva and some rural districts situated in different cantons. Districts from the German and the Italian speaking areas which display a starting process of diffusion of out-of-wedlock births are rarer. In the period 1980-90, extra-marital births increased in the French speaking area of Switzerland, especially along the border with France. Some other districts began also in the Italian speaking area, and in the German speaking area, near cities of Bern and Basel. In 2000, the onset of out-of-wedlock births already happened. This is only in some very mountainous districts that the process did not begin. In conclusion, this figure seems to show different channels of diffusion, according to the speaking area, but also according to the distinction between non-mountainous and mountainous districts.

Figure 1: Diffusion of the spread of extra-marital births in Swiss districts (1970-2000)



In red, district in which extra-marital births began to spread;
in Grey, district in which it did not
in white, district with missing values
In blue, lakes and rivers

Provisory results of event history analysis seem to show that the nearness between districts, this nearness measured with the weight defined above, have an influence on the beginning of the process of diffusion (table 1). We here present results of two binary models with the cloglog link, one for the analysis of the onset between the period 1980-1990 and the other for the period 1991-2000. In both models are only estimated the effect of the social distance between districts in which the diffusion process of extra-marital births already began and districts at the risk to start the process during the considered period. No characteristics of districts are now taken into account. Results show a significant positive effect of the distance for both periods, which means seem to show a spatial diffusion process of out-of-wedlock births between districts in which there are exchanges. In further developments, these results will be completed by the introduction district characteristics in models.

Table 1: Binomial models of starting diffusion process.

	1980-90	1991-2000
Intercept	-1.4746	0.9187
Std-error intercept	0.1823	0.1347
distance	0.5917	0.4583
Std-error intercept	0.1583	0.1508
N	169	131

Note: All coefficients estimated significant at the level of 0.01

References

Bocquet-Appel J.-P. & Jakobi L. (1998). Evidence of a spatial diffusion of contraception at the onset of the fertility transition in Victorian Britain. *Population- English Selection*. 10(1): 181-204.

Hedström P. (1994), Contagious Collectivities. On the Spatial diffusion of Swedish Trade Unions, 1890-1940, *American Journal of Sociology*, 99: 1157-79.

Klüsener S., Perelli-Haris B. & Sanchez-Gassen N. (2012). Spatial Aspects of the Rise of Nonmarital Fertility across Europe since 1960: The role of states and regions in shaping patterns of change. *MPIDR working paper* 2012-5.

Le Goff J.-M. (2011). Diffusion of influenza during the winter 1889-90. *Genus.*67(2): 77-99.

Le Goff J.-M. & Ryser V.-A. (2010). The meaning of marriage for men during their transition to parenthood: the Swiss context. *Marriage and Family Review.* 46(1):107-125.

Montgomery M.. & Casterline J.B. (1996), Social learning, social influence and new models of fertility. *Population and Development Review*. 22 (Supplement: Fertility in the United States: New Patterns, New Theories), 151-175.

Paloni A. (2001). Diffusion in Sociological Analysis. in Casterline J. B. (Ed). *Diffusion Processes and fertility Transition. Selected Perspectives*. Washington: National Academy Press.

Rossier C. & Le Goff J.-M. (2005). « Le calendrier des maternités. Retard et diversification de la réalisation du projet familial ». In Le Goff J.-M., Sauvain-Dugerdil C., Rossier C. & Coenen-Huther J. (eds). *Maternité et parcours de vie. L'enfant a-t-il toujours une place dans les projets des femmes en Suisse ?* Berne: Peter Lang, 45-83.

Wanner P. & Fei P. (2004). Fécondité dans les communes de la Suisse, 1970–2000. Nouvelles données et pistes d'interprétations. *Démos : Bulletin d'information démographiqu*e. Office fédéral de la statistique. 2 : 3-33.