State Territories and Hot and Cold Spots of Non-Marital Fertility in Europe 1900-2007
A Spatial Analysis

Sebastian Klüsener, Brienna Perelli-Harris, Nora Sánchez-Gassen, Christin Löffler
Max Planck Institute for Demographic Research

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Extended Abstract
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Abstract

This paper employs an empirical Political Geography approach to investigate the role of political and cultural borders in shaping the geographic pattern of non-marital fertility levels in Europe. Using regional-level data for European states and empires at three points in time (1900, 1960, 2007), we employ descriptive and explorative spatial statistics to analyze how the spatial pattern of non-marital childbearing changes over time. We address two main research questions: (1) Which regions of Europe had over time persistently high or low levels of non-marital fertility and which regions observed substantial temporal discontinuities in non-marital fertility levels? To what extent can these spatio-temporal (dis-)continuities be linked to past and present territories and borders of states and empires and to their policies related to non-marital fertility? (2) In which regions of Europe can we observe the emergence of strong spatial divides in levels of non-marital fertility running along political borders, suggesting that policies played a role in creating this divide? A particular emphasis is placed upon "natural experiment" regions, where culturally and economically similar regions are divided by political borders that may impact the level of non-marital fertility. The emergence or disappearance of distinct patterns of non-marital childbearing along political borders suggests that policies play a role in producing variation over time and space.

Emergence, Persistence and Disappearance of Non-Marital Fertility Hot and Cold Spots

Over the past 100 years, non-marital childbearing has waned and waxed across the European continent. An array of social, economic, and ideational forces has produced variation over time and space (Perelli-Harris et al. 2009, Kok, 2009, Kiernan 2004, Shorter et al. 1971, Laslett et al. 1980). In particular, policies enacted by states or empires on their population have often played a distinctive role in discouraging or supporting non-marital fertility. Political and policy regimes may be very instrumental in determining the legitimacy of out-of-wedlock births, requirements for marriage, or providing incentives for marriage in tax and transfer systems. On the other hand, patterns of non-marital childbearing may cross political borders, indicating that cultural factors are more important. For example, religious or linguistic divides may in some European regions be better at explaining variation in non-marital fertility.

In order to adjudicate between the role of culture versus politics in producing patterns of non-marital fertility, this paper takes an empirical Political Geography approach, which looks for interrelationships between people's behavior, state policies and the state territory on which states have the power to enforce legislation. Using macro data for the regions of European states at three points in time (1900, 1960, 2007), we employ spatial statistics to detect how spatial clusters of high and low non-marital fertility have developed in Europe over time. Thereby we are particularly interested, to what extent the borders of these clusters are linked to cultural as well as political borders (see Claval, 1974; Decroly / Grasland, 1993; Reuber, 2005). In order to detect the clusters we use different categorization methods and spatial statistics. This is done to make sure that the results we obtain are not artifacts of a particular approach. We use Local Indicators of Spatial Association (LISA) (Anselin, 1995) as well as maps based on Equal Interval and Standard Deviation categorization.

In this paper we have two main research questions: (1) Which regions of Europe had over time persistently high or low levels of non-marital fertility and which regions observed substantial temporal discontinuities in non-marital fertility levels? To what extent can these spatio-temporal (dis-)continuities be linked to past and present territories and borders of states and empires and to their policies related to non-marital fertility? (2) In which regions of Europe can we observe the emergence of strong spatial divides in levels of non-marital fertility running along political borders, suggesting that policies played a role in creating this divide? A particular emphasis is placed upon "natural experiment" regions, where culturally and economically similar regions are divided by political borders that may impact the level of non-marital fertility. This will provide evidence that states and their policies are important for determining the level of non-marital fertility. Alternatively, we will look for high non-marital fertility regions that cross political borders, indicating that culture is in this case an important factor.

Data and Methods

For the analysis we collected data on marital and non-marital live births for all European countries in the year 2007[1]. We aimed to obtain also regional level data covering usually the first sub-national level. From the data we derived the share of non-marital live births. We complemented the dataset with data from the Princeton European Fertility Project (Coale / Watkins, 1986) that includes historic data on non-marital fertility covering virtually all regions of Europe from 1900 until 1960. For some European countries even earlier data is available. The Princeton European Fertility Project dataset did not use the share of non-marital live births as indicator. Instead, they employed an index of illegitimate fertility based on a rate, which is calculated as follows:

$$i_h = \frac{1{,}000\ B_I}{\mu_i F_i}$$

where B_I denotes the annual number of illegitimate births, μ_i is the number of non-married women in the ith age group between 15 and 49 and F_i is the marital fertility of the religious sect of the Hutterites recorded in the first half of the 20th century, which is highest fertility ever recorded (Shorter et al., 1971, p. 379).

For the analysis we do not only employ I_h as the non-marital fertility rate can also be influenced by general fertility trends. Therefore we calculated a second measure by dividing the non-marital fertility rate I_h through I_f, the indicator for the general fertility rate of married and unmarried women. The latter is calculated in analogy to I_h.

It would have been desirable to use the same non-marital fertility measure for all time cuts. But this was not possible, as it would require a major effort to obtain such high quality data for all regions of Europe. It might be possible to calculate the Princeton measures for a wide number of European states as soon as the results of the upcoming decennial census round will be available. Also the inclusion of covariates would have been advantageous. But this would need a major undertaking to derive comparative economic and cultural data for all regions of Europe for the three time cuts.

The data is matched to GIS-shapefiles from the MPIDR Population History GIS collection displaying the regional administrative division of Europe in the years 1900, 1960 and 2007. The data is then analyzed with descriptive and spatial statistics. In total three sets of maps are produced. One set gives a detailed overview on marital levels based on arbitrary chosen equal distance intervals with an open top category (Fig. 1-3). The second set of maps (Fig. 4-6) is based on Local Indicators of Spatial Association (LISA) (Anselin, 1995), an explorative statistical tool to detect local spatial clusters with high or low levels of non-marital births and

[1] All data from 2007, except for the following countries: Albania (2003), Belgium (2005), Bosnia-Herzegovina (2006), Serbia (2006)

localities, where regions with high and low values border each other (high negative spatial autocorrelation). The LISA statistics are based on the Moran's I statistic (Moran, 1950) and calculated as follows:

$$I_i = \frac{z_i}{m_2} \sum_j \omega_{ij} z_j$$

with

$$m_2 = \frac{\sum_i z_i^2}{n}$$

where z_i is the deviation of the variable of interest from the mean, w_{ij} is a spatial weight matrix indicating whether region j is a neighbor of region i based on a neighborhood definition. We classify neighborhood based on a first order queen neighbor definition, which means that all regions sharing a common border or vertice are considered neighbors. An exception is made for islands or island groups, where geographical proximity is employed to detect neighborhood relations. The cluster detection is based on a Monte-Carlo-Simulation with 9999 permutations, using a pseudo-significance level of 0.05. A disadvantage of LISA are problems to detect small clusters. Also a low number of neighbor regions can result in non-detection of a cluster membership. This is particularly problematic as the level of geographical detail in the administrative division of Europe is changing substantially over the three time cuts observed, particularly in Central Europe. This problems were a main motivation to produce a third set of maps (Fig. 7-9), in which regions having non-marital fertility levels higher than one standard deviation from the mean are marked blue and those one standard deviation low are marked orange.

Discussion and Results

From Fig. 1 – 3 we can see general trends over the last century. In 1900 many regions had relatively high levels of non-marital fertility, but most of them had experienced already a substantial decline in the late 19th century (see Shorter, 1971). This decline continued in most of Europe until the 1960s and led to "Golden Age of Marriage" (Fig. 2). Since then most European regions experienced a substantial increase (Kienan, 2004; Perelli-Harris, 2009). However, it is important to note that Fig. 3 displaying the levels in 2007 is not completely comparable to Fig. 2 as they are based on different indicators of non-marital fertility.

From the Fig. 4-6 displaying hot and cold spot of non-marital fertility one can also see that the spatial pattern is far from random and that clusters with high and low fertility levels are often linked to the territory of states and empires. This is for example the case for the Austrian-Hungarian Empire in 1900 or for France and Bulgaria in 2007. In 2007 regions with very high non-marital fertility rates are Iceland, the Northern parts of Sweden and Norway, Estonia, East Germany, Bulgaria, Southern Austria and Northeastern Slovenia. Very low levels can be found in a central European area covering Southeast Poland, Western Ukraine and Western Belarus, Southern Italy, Albania, Montenegro, Greece and Cyprus.

We will first look at those countries and regions that exhibited a strong continuity with regard to high or low levels of non-marital fertility. The only country that had high levels of non-marital fertility throughout the period studied is Iceland in the far Northwest of the continent. Studies have shown that this is linked to a long tradition of fertility among cohabiting couples (see Björnssen, 1971). A subnational region in Scandinavia with consistent high levels of non-marital fertility is Northern Sweden, where also cohabitation as an old Scandinavic tradition might have played a role (Trost, 1978).

Apart from Scandinavia other areas with persisting high levels of non-marital fertility can be found in Central Europe, namely today's East Germany, today's West Poland and today's Southeastern Austria. The reasons, why East Germany was already in 1900 a hot spot of non-marital fertility are manifold and complex (see Klüsener / Goldstein, 2009). They might be connected to an early secularization process, to peculiar agricultural economic production schemes and to effects of legislation by the East German states of Prussia and Saxony. When East Germany was an independent state from 1949-1989, state policies contributed to elevate the non-marital fertility levels even further (Salles, 2006).

Today's West Poland is an interesting case as this area experienced virtually a complete replacement of its population after 1945. Nevertheless it a hot spot of non-marital fertility throughout all three time periods studied. The factors causing high levels in 1900 are likely to be similar to the ones causing high levels in today's East Germany as conditions in today's West Poland did not differ much from conditions there. That North Poland remained a hot spot after 1945 might be related to the forced resettlement of the new population into this area, which contributed to disconnect old societal and intergenerational bonds. Today, these Western regions are less conservative than Central and Eastern Poland, which one can also study in the voting behavior of the population. Thereby, the divides in voting behavior follow still the old borders (see Barwinski, 2006). The persistent spatial divide inside Poland with high levels of non-marital fertility in the North-West and low levels in the South-East, which is visible both in 1960 as well as in 2007, also suggests that the Polish state is not exerting policies that are specifically supporting or discouraging non-marital births.

The hot spot of non-marital fertility in South Eastern Austria (Styria, Carinthia) is considered to be a remnant of traditional cultural practices related to allowing marriage only to those that had property and a relaxed attitude towards non-marital sexual intercourse (see Khera, 1981). Apart from these Central European areas the Kosovo in South Eastern Europe is another region with consistent high levels of non-marital fertility at least for the period for which data is available (1960-today). This might be explained by the fact that a part of the Albanian population of this area practices common-law marriage without official registration (Rasevic / Petrovic, 2001, p. 3). It is interesting to note, that the Albanian population in Albania and the Former Yugoslavian Republic of Macedonia does not seem to practice such common-law marriage behavior, as both of these states are cold spots with regard to non-marital fertility levels. We will come back to this case below.

If we now turn to the countries and regions that were in all three time periods studies cold spots of non-marital fertility, it is apparent that most of these countries are situated in South Eastern Europe. This includes Greece, where both cultural and political factors seem to play a

role that non-marital fertility continues to be low (Barnes, 1998). The same is true for Albania, where marriage is still almost universal and continues to occur at very young ages (Gjonca et al., 2008, p. 278). Also Montenegro has been a region with low illegitimacy throughout the period for which data is available, which made it in the 1960ies a distinct outlier within Yugoslavia (see fig. 5 a/b). Apart from these South Eastern European countries also Switzerland had low non-marital fertility levels throughout the period studied. This is also related to a mixture of culture and policies (see e.g. Rossier / Le Goff, 2005).

There are also countries with distinct discontinuities. The most notable one is Bulgaria that had initially very low levels of non-marital fertility when it got independent from the Osman Empire in the late 19th century. But starting from the 1910 Bulgaria slowly turned in a country with relative high levels of non-marital fertility in Europe (Shorter et al., 1971, p. 377). After a period of stagnation this process accelerated again in the early 1990ies, making Bulgaria one of the countries with high non-marital fertility levels in Europe. Countries, which had for a long time low levels of non-marital fertility, but changed swiftly to higher levels recently are the Netherlands, Norway and Ireland. In the Dutch society cohabitation had long been regarded as a deviant behavior (Kok, 2009, p. 23). But this has changed since the 1970ies (Masui, 1987, Kok, 2009, p. 31), which was also accompanied by legal reforms to give cohabiting couples similar rights compared to married couples (Schramma, 2008).

There is also a number of countries that moved from a mixed spatial pattern around 1900 to extremely low rates throughout the whole country during the Golden Age of Marriage.. This includes the countries of Italy, Spain, Russia and Finland. The even pattern of low non-marital fertility rates throughout the whole country in the beginning of the Golden Age of Marriage suggests that policies played a role in shaping this pattern.

Turning to “natural experiment” regions, where people with similar cultural background are divided by political borders France and the French part of Switzerland form an interesting case. While France has over the last decades turned in one of the European countries with highest non-marital fertility rates. Switzerland, on the contrary, belongs to the regions with very low non marital fertility levels, making it likely that differences in policies played a role in creating this divide.

Another natural experiment region seems to be the Western Balkan, where one can find a patchwork of regions with high and low non-marital fertility levels that largely seem to follow political borders. It has already been mentioned above that the Kosovo with its high share of Albanians has rather high levels of non-marital fertility, while Albania and the Western part of FYR Macedonia, where Albanians are also in the majority, have extremely low levels of non-marital fertility. It would be interesting to study whether the hot spot in the Kosovo is the result of a cultural peculiarity of the Kosovo Albanians, or the results of different policies in the three countries.

Also Bulgarians and Macedonians share culturally and historically a lot of similarities. Nevertheless, Bulgaria is today a hot spot of non-marital Fertility in Europe, while FYR Macedonia is a distinctive cold spot. But this divide has not a long history and did not exist in

the early 1960ies (see Fig. 2), making it likely that also in this case policies played a role in creating the divide.

It is questionable, whether West and East Germany can be considered a natural experiment region. It is without a doubt, that the old German-German border is still also a demographic divide with regard to non-marital fertility. It is also proven that East and West German policies played an important role in increasing this divide. But the fact that East Germany was already around 1900 a hot spot of non-marital fertility leaves doubts whether West and East Germans were culturally similar before 1945, when it comes to family formation practices (Klüsener / Goldstein, 2009).

Conclusion and Outlook

In this paper we were able to show that hot and cold spots of non-marital fertility can, both in the past and present, often be related to the territory of states and empires. The reasons for the emergence, persistence and disappearance of such clusters are often linked both to cultural and political factors. We were also able to point out a number of "natural experiment" regions for further study on the effects of politics and culture. Particularly South Eastern Europe seems to be an interesting field for case studies.

We plan to investigate further to what extent the emergence, persistence and disappearance of high and low clusters of non-marital fertility can be linked to the political sphere. In addition, we want to increase the number of time cuts to six by also collecting information for the years 1870, 1930 and 1990. It is also envisioned to evaluate alternative spatial statistics methods to detect borders apart from the ones employed in this paper. A particular focus will be on methods that are in contrast to LISA and Standard Deviation categorization not only looking at extreme values, but are also able to detect borders between areas with values in the middle range of the distribution.

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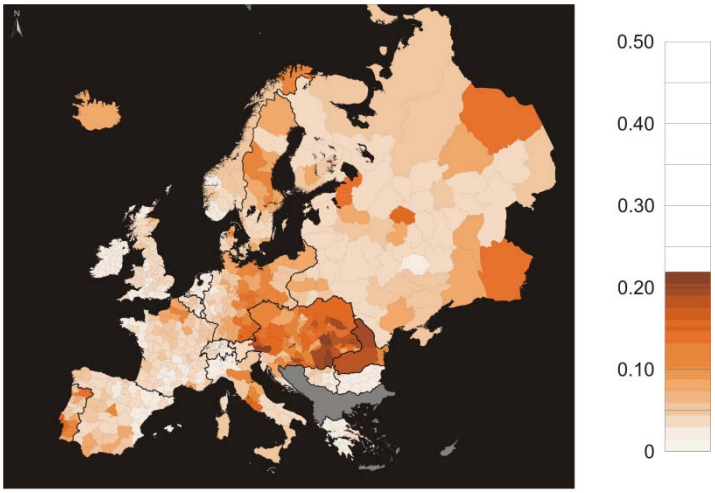
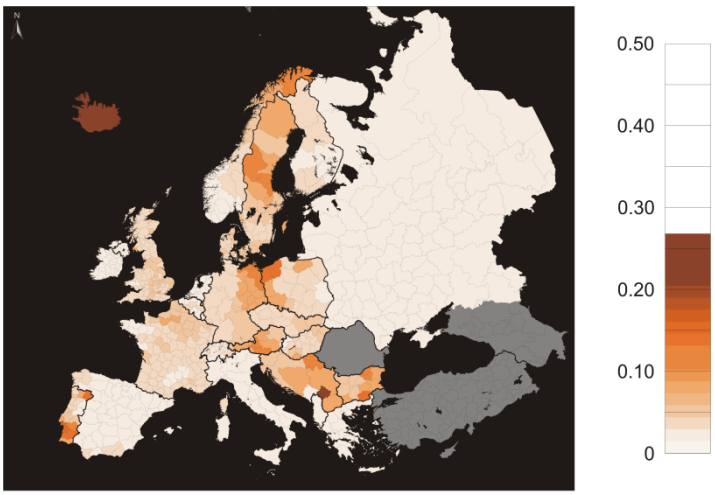
Appendices

Fig. 1: Non-Marital Fertility Rate (I_h) ~1900



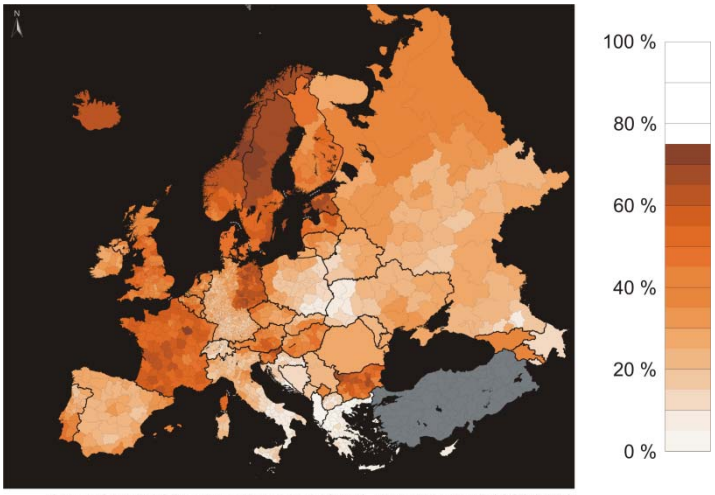
Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

Fig. 2: Non-Marital Fertility Rate (I_h) ~1960



Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

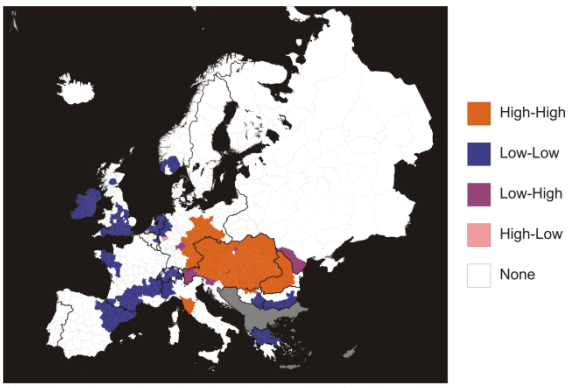
Fig. 3 Share of Non-Marital Births as a Total Number of Live Births ~2007



Source: Statistical Offices; Base Map: Eurostat (2003), extended by MPIDR/ CGG (2009)
Cartography: Klüsener, MPIDR (2009)

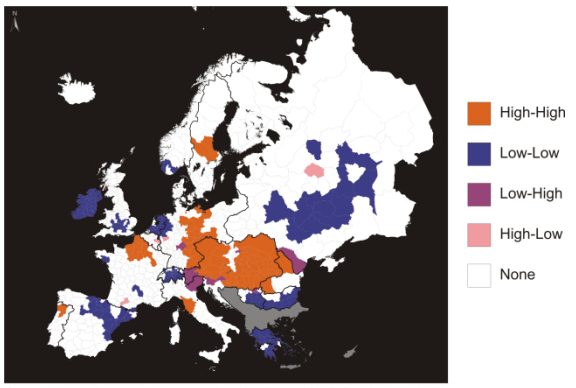
Fig. 4 a/b: Hot and Cold Spot Detection Based on Local Moran's I Statistics ~1900

I_h



Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

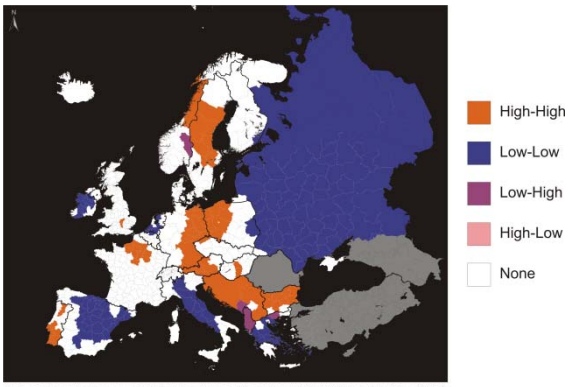
I_h / I_f



Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

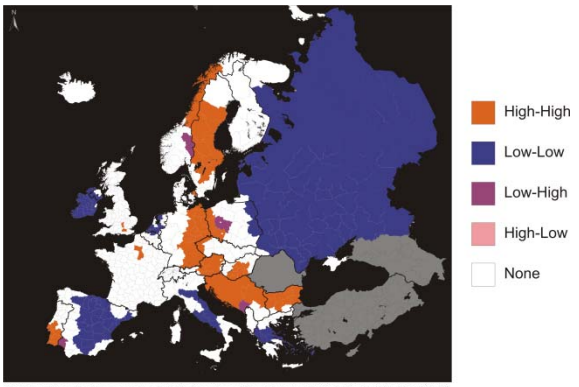
Fig. 5 a/b: Hot and Cold Spot Detection Based on Local Moran's I Statistics ~1960

I_h



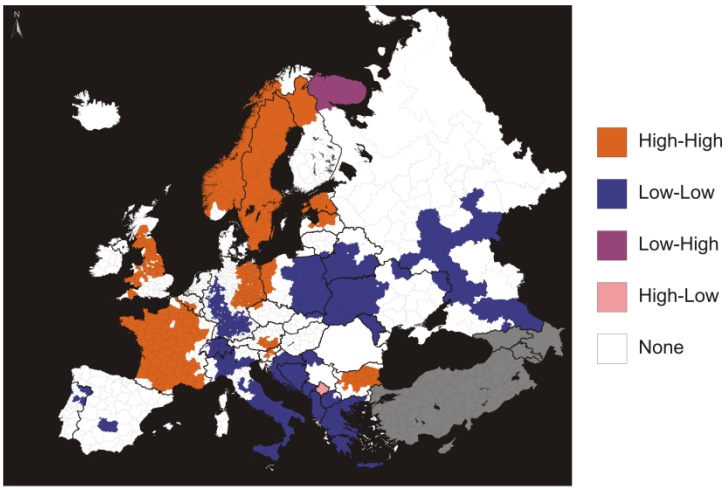
Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

I_h / I_f



Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

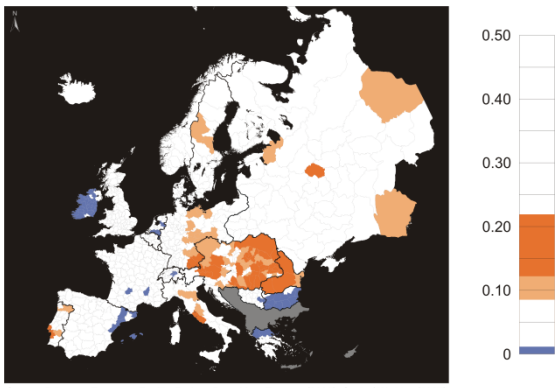
Fig. 6: Hot and Cold Spot Detection Based on Local Moran's I Statistics ~2007



Source: Statistical Offices; Base Map: Eurostat (2003), extended by MPIDR/ CGG (2009)
Cartography: Klüsener, MPIDR (2009)

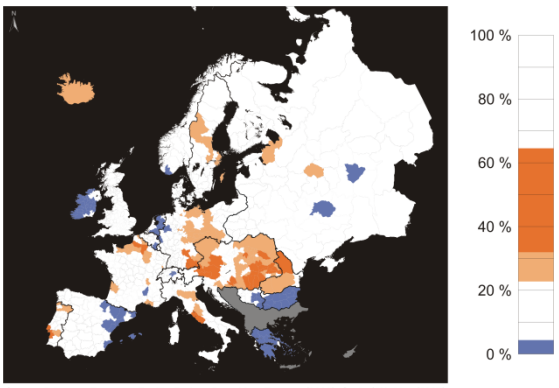
Fig. 7 a/b: Hot and Cold Spot Detection Based on Standard Deviation ~1900

I_h



Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

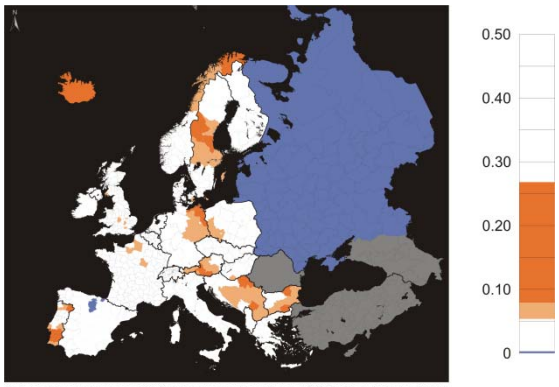
I_h / I_f



Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

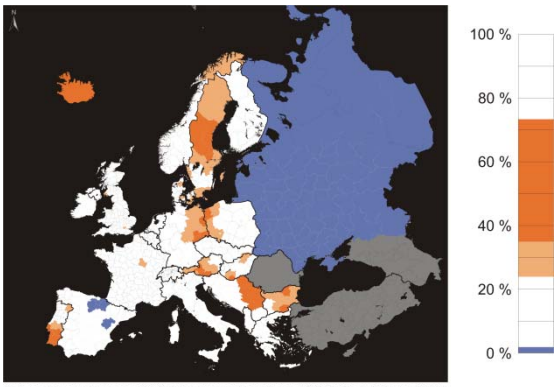
Fig. 8 a/b: Hot and Cold Spot Detection Based on Standard Deviation ~1960

I_h



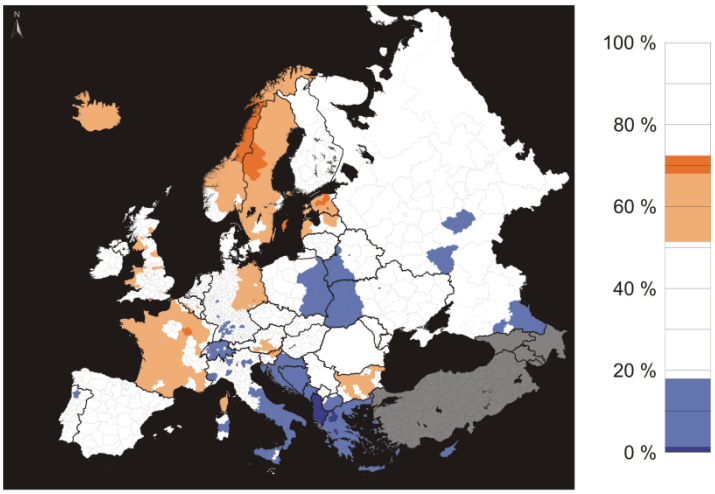
Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

I_h / I_f



Source: Princeton European Fertility Project; Base Map: Eurostat (2003); Coale / Watkins (1987)
Cartography: Klüsener, MPIDR (2009)

Fig. 9: Hot and Cold Spot Detection Based on Standard Deviation ~2007



Source: Statistical Offices; Base Map: Eurostat (2003), extended by MPIDR/ CGG (2009)
Cartography: Klüsener, MPIDR (2009)