

Spatial Variation of Sub-national Fertility Trends in Austria, Germany and Switzerland

Stuart Basten, Johannes Huinink, Sebastian Klüsener

Abstract: Sub-national trends in fertility are of great importance for policy makers and regional planners. This paper aims to provide a theoretical and empirical framework for policy makers, taking into account past and present trends in fertility, as well as their theoretical underpinnings. These will, we argue, be crucial in determining future trajectories and potential political responses to them.

The theoretical part of the paper deals with the factors that may influence fertility differences at the sub-national level, including decisions and life course trajectories at the individual level, as well as contextual socio-economic phenomena operating at different geographical levels (local, regional, national, global). This is followed by an empirical section, which takes the Eurostat publications on spatial fertility differences in Europe as a starting point. In an attempt to overcome the limitations of these reports – both in terms of the lack of geographic detail and the short time span covered – we provide more thorough overviews for Austria, Germany and Switzerland. Using historical data from the Princeton European Fertility Project and other sources, we have been able to reconstruct comparative regional fertility time series for the past 150 years. Finally, we present a case study on local fertility development in the municipalities and unified rural communities of the German state of Lower Saxony and the districts of the German city of Bremen.

Based on the results of this analysis, we conclude that the recent degree of fertility convergence between regions within countries – particularly at the macro-regional level – is, indeed, striking. However, taking a long-term perspective, we are able to identify some substantial time periods over the last 150 years in which regional fertility levels diverged. This implies that the current picture must not necessarily constitute Fukuyama's "end of history" over the coming decades. Moreover, the study of local-level data reveals that, in contrast to the overall macro-regional fertility convergence process in all three countries, a trend towards divergence can be observed within the city of Bremen. This demonstrates that local divergence can run parallel to overall regional convergence.

Keywords: Fertility · NUTS-2 · Spatial variation · Sub-national fertility

1 Introduction

The articles of *Sobotka et al.* (CPoS 36,2-3) and *Philipov/Bernardi* (CPoS 36,2-3) have considered the individual and social decision-making processes which affect child-bearing in German-speaking countries. In this article, we place a greater emphasis upon the *spatial* dynamics. Over the last few centuries, we have witnessed increased integration of localities into nation-states, global networks and institutions. As a result, today's local conditions are heavily influenced by structures and processes operating at the national, supranational and global levels (*Giddens* 1990). Naturally, this has implications for spatial differentials in demographic behaviour. For example, in *From Provinces into Nations*, *Susan Watkins* observed that, in "1870 national boundaries were faint on the demographic map of western Europe; by 1960, they were deeply etched" (*Watkins* 1991: xiii). Despite this, she predicted that national boundaries of states will become less relevant as demographic divides due to European integration and globalisation processes (see also *Agnew* 2008).

In order to better anticipate future trends, it is crucial to know both the theoretical underpinnings of these spatial differentials, and the empirical studies on current developments. Thus, in Section 2, we present a review combining the theoretical background and a review of the literature. This highlights the key factors which are likely to drive future trajectories of sub-national fertility. Having established the theoretical framework for examining sub-national trends of fertility, we demonstrate some of these features empirically. This is based on *Eurostat's Regional Yearbooks* (e.g. *Eurostat* 2010a), which include data on sub-national fertility, and on how they relate to other population trends, with a particular focus on the NUTS-2 level.¹

We extend the empirical analysis performed in the Eurostat reports in a number of ways. First, we integrate data from other sources to examine longer-term patterns in regional fertility. This allows us to place the current evidence in a much broader temporal context. Fundamental to our understanding of patterns of sub-national fertility are the geographic units that we elect to employ. In order to provide a comprehensive cross-continental comparative framework, the Eurostat reports are uniform in their examination of regional fertility at the NUTS-2 level. However, even among these three German-speaking countries, the NUTS levels at which a regional "affiliation" is felt, or at which regional policy is shaped, are each different: the Swiss cantons (NUTS-3), the Austrian *Bundesländer* (NUTS-2) and the German *Bundesländer* (NUTS-1). In Germany, in addition to the *Bundesländer* level, the NUTS-2 level is also of relevance for regional identification. This level consists of smaller *Bundesländer* and the *Regierungsbezirke* of bigger *Bundesländer*. We therefore present evidence from the most appropriate country-specific NUTS level.

¹ All statistics at the regional level within the EU are based on the nomenclature of territorial units for statistics (NUTS). The NUTS classification has been used for regional statistics for many decades, and has always formed the basis for regional funding policy. It was only in 2003, though, that NUTS acquired a legal basis, when the NUTS regulation was adopted by the Parliament and the Council. (For a full explanation, see *Eurostat* 2010b).

Second, we perform an empirical analysis using small-scale local data to detect more nuanced patterns at a specific level. A crucial caveat is that NUTS regions are frequently highly artificial, and cut across established cultural boundaries. For the small-scale analysis, we compiled data on the municipalities and unified rural communities (*Samtgemeinden*) of the north German state of Lower Saxony (*Niedersachsen*), and information on the districts (*Stadtteile*) of the German city of Bremen. The latter belongs to the city-state of Bremen, and constitutes an enclave within the state of Lower Saxony. Our analysis covers the period 1971-2006. To our knowledge, there is no other existing dataset that provides fertility trends in a predominantly German-speaking area on such a small geographic scale, and over such a long period of time. Furthermore, such micro-analyses of fertility are relatively rare given the tendency of social scientists to unreflectively gravitate towards the use of easily accessible national level data and nations as units of comparative analysis, otherwise known as the “whole-nation bias” (*Snyder 2001*).

Socio-geographical analyses of fertility are relatively rare in the current policy literature (*Boyle 2003*). This may be because it is widely assumed that, in modern and post-modern societies, fertility patterns gradually converge within and across countries, and because there is evidence that convergence at certain NUTS levels is indeed taking place. But, like other expectations about the consequences of modernisation, this convergence may not materialise. By combining the latest empirical and theoretical evidence for these three countries, we hope to build on the articles of *Sobotka et al.* (in CPoS 36,2-3) and *Philipov/Bernardi* (in CPoS 36,2-3), and thereby provide some firmer foundations upon which our assumptions about the future of fertility in German-speaking countries can be based.

2 Theoretical approaches to the social geography of fertility

2.1 What causes regional fertility differences in contemporary Europe?

Regional effects on fertility behaviour are not easy to identify. In general, one can assume that they stem from different aspects of the living conditions of individuals – which we refer to as the “local opportunity structure” – in the regional or the local context which influence the incentive structure of potential parents and their children in different ways. However, this is not the whole story.

A more adequate approach (e.g. *Werlen 1995*) differentiates between two groups of mechanisms - *compositional* and *contextual effects* - that can contribute to regional fertility differences. Compositional effects are caused by the fact that inhabitants of different regions (e.g. different administrative units) are distributed differently with regard to individual-level characteristics related to fertility behaviour, such as educational attainment or socio-economic status. Contextual effects are caused by the fact that aspects of the local opportunity structure in regions in which the individuals live encourage or discourage them to have children. The composition of a region’s population with regard to a certain attribute can, at the same time, also be a relevant contextual factor. If, for example, a region is mostly inhab-

ited by individuals with a conservative world view, this might provide a conservative societal context. The latter may also affect the decisions of individuals with a non-conservative world view, who may choose to engage in conservative behaviour to avoid diminishing their local social capital.

The local opportunity structure encompasses:

- (1) the *material and institutional (infra-)structure*, including the degree of urbanisation, the level of family-relevant services, other local conditions of family life and housing, and other place-related issues, such as environmental factors;
- (2) *economic conditions* and prospects on the local *labour market*, which may, for example, be indicated by the level of unemployment, the availability of attractive jobs and the degree to which the local economy supports the work-family balance;
- (3) *socio-structural factors* in the area of residence, such as the degree of socio-economic segregation or the socio-structural composition of the partner market;
- (4) *cultural factors* which contribute to a localised *social climate*, such as fertility- and family-related values, gender roles and social norms; and
- (5) *embeddedness in local social contexts*, such as neighbourhoods, local kin and networks of friends.

The local opportunity structure of regions and particularly their socio-structural composition is strongly interlinked with interregional migration which, therefore, is of fundamental importance in the analysis of regional specific fertility. Selective migration can contribute to the selectivity of both stayers and movers with regard to relevant individual attributes. In a typology, *Huinink and Wagner (1989: 673)* disentangled the interplay between regional effects and migration outcomes on individual behaviour, which allows for a better explanation of regional-level fertility parameters. With regard to movers from a region A to a region B, we can distinguish (at least) three sub-cases, which are also considered in the current literature (*Kulu/Milewski 2007*):

Assimilators: Movers change their behaviour in response to the different fertility-related local opportunity structure in regions A or B. They adapt to the new regional environment in region B. In their region of origin A, they behaved in line with the behavioural pattern predominant in region A. This assimilative behavioural pattern contributes positively to the difference in regional level fertility parameters. This is referred to in the literature as the *adaptation hypothesis*.

Context selectors: Movers move to region B, because it is more suitable for their intended fertility behaviour. They should be distinct among the population of the region of origin A due to the fact that they anticipate such a move. Because this case requires that the relevant local opportunity structure in the region of destination B is different from that of region A, we observe an indirect regional effect on the migration decision which amplifies the regional difference in the level of fertility parameters. In the literature, this is called the *selection hypothesis*.

Persistently socialised: Movers stick to the behaviour they learned in the region of origin A and probably differ from the stayers in region B. This tends to decrease the contrast in fertility parameters between regions. In the literature, this is called the *socialisation hypothesis*.

A number of studies have supported one or the other of these hypotheses (Kulu 2005; Kulu/Boyle 2009), but more research is needed. Long-term longitudinal data would allow examining the effects of residential relocation on the fertility of migrants more closely. In any case, our understanding of the fertility patterns of migrants is that they are shaped by the spatial and compositional contextual factors in both the sending and the receiving areas which will be outlined below.

2.2 Material and institutional infra-structure

The *degree of urbanisation* is an important factor in regional patterns of fertility. To explain the low fertility in cities, we can refer to the familiar argument that living in an urban area should decrease the motivation to have children, because these areas offer more attractive alternatives to family life (Hank 2002) – i.e. the opportunity costs of having children are higher in cities. A second set of arguments revolve around different living conditions for families: the architectural environment is said to provide less room for young children's activities and for larger families, and to be too unsafe to allow children to play and spend time outdoors without parental supervision. The social environment is characterised by anonymity and a dearth of relationships with trusted individuals outside the family. Thus, cities are often seen as less safe settings for children to grow up in, which could encourage selective migration of families to the suburbs.

However, the quantity and quality of the provision of facilities essential for daily living may, in fact, be better in cities than in rural areas. The same is true for the density of day care facilities. This is positive for families. The favourable infrastructure, which provides families with a means of organising daily life, might make living in cities more attractive. Cities could be a better place for parents to combine family-related tasks with their interests in other life domains (e.g. career opportunities), and to balance the pursuit of career and personal interests with child-rearing and parenting. These considerations are becoming increasingly important as more young couples pursue a wider variety of non-family activities. Given the trend towards urbanisation in Europe and throughout the world, this effect could probably play a greater role.

Different regions have different levels of *family-related services*, like day care facilities, both formal and informal. The extent to which these services are available should be relevant for individual fertility behaviour, because they make it easier to balance family and work. In particular the interaction of child care provision with other local/regional family policy measures (Neyer/Andersson 2008; Baizán 2009) could play a significant role in extent to which these measures shape fertility.

Another aspect causing strong compositional effects on regional period fertility measures is the existence or absence of post-secondary and tertiary institutions of education. Most of these institutions are located in urban centres. These regions

usually experience a substantial in-migration of young men and women who are attending those institutions. Most of them do not intend to have children while they are students, and postpone starting a family until after they have finished their studies (e.g. *Blossfeld/Huinink* 1991; *Kreyenfeld/Mika* 2008). And before starting a family, a substantial number of women will have left the area where they studied. As a result, university towns are reporting very low period total fertility rates (TFR) today, sometimes even below 1.0 (e.g. the German town Heidelberg with a TFR of 0.95 in 2006; *Statistisches Landesamt Baden-Württemberg* 2007).

2.3 Local economic conditions

The local *economic conditions* and prospects in the regional *labour market* must be considered as well. Again, the assumed correlation with fertility behaviour is not clear-cut. It also depends to some extent on the welfare state policies and local family support systems (e.g. unemployment support, provision of day care facilities). A positive relationship between economic prosperity and good labour market prospects for women on the one hand, and fertility on the other, may be expected if the opportunity costs of childrearing can be kept sufficiently low. Then one can observe a pro-cyclical development of birth rates as found in Sweden (*Andersson* 2000). If the opportunity costs are high, they may even increase together with labour market prospects. In this case, fertility tends to be low, and patterns of polarisation in regard to the number of children can be observed (*Huinink* 2002).

Another factor is housing, which encompasses both *housing conditions* and the regional *housing market* (*Mulder* 2006a/b). We can, however, assume, that housing is more likely to affect selective migration than to influence fertility plans directly (*Mulder/Wagner* 2001; *Kulu/Vikat* 2008). However, the emergence in recent years of footloose industries and services, as well as teleworking, has, at least for some groups of actors, provided opportunities to move to rural areas with easier access to housing, without substantially affecting income opportunities. Finally, we may want to consider *region-related features or aspects of the natural environment* (*Anderson* 1986). In contemporary European countries, however, these features might be of minor importance.

2.4 Socio-structural factors

The local conditions and the socio-economic composition of the local *partner and marriage market*, which enables single people to establish sufficiently satisfying relationships, is an important regional factor in family development (*Lichter et al.* 1991; *Lloyd/South* 1996). The probability of spatial homogamy is considerable (*Haandrikman et al.* 2008; *Haandrikman et al.* 2010).

The *socio-economic composition*, or the segregation of the population of a region or a local area, is important in many other aspects. While it operates less through direct effects on fertility beyond the related individual characteristics, the socio-economic composition is correlated with the infrastructure of an area, and the area's (sub-) culture and social climate. It is also shown that there are strong correla-

tions between indicators of the composition of the population by socio-economic status or ethnicity, and the level of fertility in regions. A good example is urban districts as regional units (*Strohmeier/Kersting* 1996; *Hank* 2002).

2.5 Cultural factors

The theory of the “second demographic transition” (SDT) posits that secularisation and religiosity, the level of individualisation and the relevance of postmodern values and life goals, i.e. ideational change, are important causes of changing fertility behaviour (*Lesthaeghe/Neels* 2002; *Lesthaeghe/Neidert* 2006). Indeed, it is argued that apart from the effects of selective migration, the social control of fertility is among the decisive features that explain (stable) regional differences in both levels of fertility and the onset of change (*Lesthaeghe* 1980). The relevance of cultural patterns—after socio-economic differences are taken into account—has been shown for a number of countries (*Knodel* 1974; *Anderson* 1986; *Nauck* 1995). For example, the Princeton Project found that differences in fertility levels between culturally heterogeneous regions are greater than rural-urban disparities (*Sharlin* 1986). However, this can also be an artefact of using provinces as the unit of analysis. Based on more fine-grained data for the Prussian districts, and contrasting Protestant and Catholic areas by urbanisation degree, the findings of *Sharlin* can only be confirmed for the pre-first demographic transition period (*Klüsener/Goldstein* 2012).

According to Inglehart *value change* is driven by the succession of cohorts growing up in the (local) socio-cultural and economic setting of their parents (*Inglehart* 1977). He assumes the cohort members themselves do not change their individual values over the rest of their life. Even though this kind of “socialisation hypothesis” is debatable theoretical and empirical evidence support it at least in part. We can assume that stable socialisation effects are in action at least for stayers in a certain region, where a stronger social control by kin might increase the likelihood of adhering to intergenerational norms. In this case, value change is not just slow, but cultural patterns are also linked to the region through socialisation and transmission mechanisms. It had been anticipated that, with advancing modernity and the increasing universalism of values, this regional link would be weakened. However, it seems that regional attachments remain strong. Why should proven practices for organising life change so quickly or drastically that the regional community reject these norms overnight? Thus, it has often been observed that people in rural areas are more prone to hold traditional values, to be religious and to adhere to conventional family norms.

When studying how cultural factors work, *Szreter’s “communication community”* is a helpful concept. It arose from the observation that there are huge differences in fertility among people with the same status in different regions of England in the early 20th century (*Szreter* 1996). In his study of fertility in Britain in 1860 to 1940, *Szreter* assumed that fertility behaviour is the outcome of a complex interaction between individual characteristics, structural conditions in the region and customised patterns of courtship, marriage and childrearing behaviour. Communication communities are not necessarily restricted to a certain region. They unite

groups of people “striving after similar social and cultural goals and adopting similar gender and work roles and sharing a similar language” (Szreter 1996: 546). They encompass complex codes that are learned and internalised during early life, in the family and in the neighbourhood. Even though this concept was developed as part of an historical study, the principle behind it could still be useful in understanding the relevance of *local social norms* established and stabilised by social exchange and interaction (Blau 1977).

Another concept which addresses the relevance of culture is *social climate* (Adriaanse 2007). It connects cultural issues with the interaction structure in communities. Szreter’s concept of a communication community had emphasised the relevance of family and neighbourhood in the transmission process of cultural values and norms. He also noted the existence of reinforcing processes, which stabilise such contexts (Szreter 1996). These processes take place in a complex grid of social relationships, in which social approval and esteem play important roles for the behaviour of individuals. The social context that makes up the social climate usually has a local basis, even though old-fashioned neighbourhoods no longer exist, and regional ties are less apparent (but are not completely lost).

2.6 Embeddedness in social relationships and networks

Social interaction in social networks is a particular dimension of the local environment which affects fertility and, importantly, migration decisions. Their impact can be broken down into the effects of social learning, social influence (imitation) and social support (social capital) (Montgomery/Casterline 1996; Kohler 2001; Keim et al. 2009; Rossier/Bernardi 2009).

The effects of the deliberately chosen social relationships in a social network are difficult to study because of processes of self-selection, starting with the selectivity of the eligible people. Moreover, we prefer to have close contact with people who share our orientation and our ideas about the way to live, which further promotes self-selection. Therefore, the effects of the social network can only be identified if we have the opportunity to follow the dynamics of social networks closely.

2.7 A convergent or divergent future?

So, what *will* the future hold for sub-national spatial differences in fertility? To begin to answer this question, we must also look back at recent and historical patterns. Watkins (1991) argued that several aspects of the nation-building process contributed to a convergence of regional differences in demographic indicators. One is the establishment of education systems with rather standardised curricula, usually favouring the most prevalent language. This increased the linguistic homogeneity in most of the Western European countries. The standardisation of the curricula probably also contributed to a convergence in social norms with regard to family formation behaviour. The increased linguistic homogeneity supported the establishment of mass media with nationwide reach, which became technically possible

due to advancements in the transport network and communication technologies (e.g. radio and television) (*Basten* 2010).

Another important process was the development of national markets and transport networks, which led to a decline in sub-national spatial economic inequalities (*Watkins* 1991). In addition, many nation-states introduced programs to support regions where development lagged, through which they actively tried to harmonise economic conditions. As demographic behaviour is affected by economic circumstances (*Becker* 1991), this probably also contributed to convergence of sub-national spatial variation in demographic behaviour. In addition, the introduction of national welfare state institutions, such as the pension system, unemployment insurance schemes or family policies, led to a homogenisation within each nation-state of local conditions for individuals seeking to start a family.

However, in her concluding chapter, *Watkins* noted that she expects the nation-states of Western Europe to become less important with respect to shaping the demographic map of Europe. She observed that the European integration process, including the creation of the common market of the EU and EFTA countries, is likely to lead to a convergence of economic conditions among countries (e.g. *Cuadrado-Roura* 2001). However, it should be pointed out that the European Union, despite being one of the most important supranational bodies in Europe, still has little to say in the area of family policies and other important welfare state institutions, such as the pension system. These are mostly still the sole responsibility of the national governments.

Indeed, despite *Watkins'* hypotheses, a number of economists and sociologists have suggested that the coming decades will, in fact, be characterised by increased divergence and fragmentation (*Veltz* 1996; *Menzel* 1998; *Krätke* 1995). Based on empirical economic findings on France, *Veltz* (1996) developed the hypothesis that the accelerating globalisation process will lead to the development of an "archipelago economy". In this economy, the "global cities" (*Sassen* 1991) will be the centres of capital accumulation. These centres will be connected by communication corridors, which also benefit from growth effects. This promotes the development of a network pattern of the spatial economic organisation of these societies. Areas that are not part of this network will probably slow down with regard to their development. *Veltz* also hypothesised that this will occur because nation-states are losing the ability to redistribute resources to areas lagging behind in this process. A related theory by *Menzel* (1998) posited that we will see increased societal fragmentation at all geographic levels. Indeed, *Menzel* argued that inequality is increasing at the global level, as well as the national and local levels. This theory is supported by urban studies that provide evidence of increased spatial segregation by social status (see *Maloutas* 2004). It is likely that the emerging divide into regions with shrinking populations, and regions with growing or stable populations, will lead to economic fragmentation processes, as rapid population ageing and decline are very likely to negatively affect regional housing markets and the tax revenues of local and regional authorities.

A final process with potential relevance is sometimes called the "end of geography" (*Graham* 1998; *Cairncross* 2001). As recently as in the early 19th century, most

social interaction was still local in character. This has changed drastically over the last 200 years, due to advancements in transport and communication technologies (Harvey 1990). This process has gained further momentum over the last 20 years due to the creation of the Internet and mobile communication technologies. These communication systems allow people to stay connected and share thoughts, even if they are thousands of kilometres apart. As a result, today it is possible for individuals to maintain a social network stretching over several continents at relatively low costs. This clearly has implications for the analysis of fertility, as local living conditions may lose relevance as an influencing factor of behaviour. But while this trend towards globalised communication might foster further convergence, it is unlikely to lead to an end of spatial differences in the future, as most daily routines still need to be carried out in the real world, where individuals are confronted with geographic distances to artefacts such as infrastructure.

Having considered the theoretical underpinnings with respect to the analysis of the social geography of fertility, we now turn to an examination of the empirical evidence.

3 Empirical trends in sub-national fertility in Austria, Germany and Switzerland

Conducting research on sub-national fertility trends in the three predominantly German-speaking countries of Austria, Germany and Switzerland is challenging as we are faced with severe data constraints. In contrast to the Scandinavian countries or the Netherlands and Belgium, no detailed population register data are available. Most of the existing individual-level datasets on Austria, Germany and Switzerland with relevant family formation information are too small to allow us to examine fertility trends on a small geographic scale. Therefore, for this paper we base our empirical analysis on aggregate-level fertility data.

3.1 Expanding the Eurostat-dataset

The analyses employed in the Eurostat *Regional Reports* (e.g. Eurostat 2010a) are necessarily constrained by the need to present a harmonised, continent-wide dataset. These constraints are both temporal, in the use of recent data; and spatial, in the employment of NUTS regions. In this section, we extend the Eurostat analyses in both aspects. First, we employ historical data in order to gauge the extent of convergence over a longer period of time, and to show the historical significance of this change at the regional level. To do this, we combine the latest available data with evidence from the Princeton European Fertility Project and national printed statistical yearbooks. As previously mentioned, however, a universal analysis based on the NUTS-2 level – or, indeed, on the NUTS-1 or NUTS-3 levels – may miss many important cultural, social and economic factors which play key roles in shaping the social

geography of fertility. Therefore, we expand (or limit) the Eurostat report *spatially* by conducting a case study with fine geographic detail.

3.2 Data sources

Creating long historical time series of fertility rates for given regions is fraught with difficulties. One of the problems relates to the spatial consistency of the regions over time. In attempting to construct as long a time series as possible, we have sought to identify regional level differences in fertility stretching back to the mid-19th century. However, it goes without saying that the period 1860-2010 saw German-speaking countries altered and shifted to a hitherto unheard of degree. The formation of the German Nation-state, and the rise and fall of Austria-Hungary, National Socialism and the GDR each played a role in shaping the sub-national regions which made up their ever-shifting borders. Fortunately, however, the *Bundesländer* of Austria and the cantons of Switzerland have stayed *relatively* constant over time. The rather more turbulent nature of Germany's borders will be examined shortly.

Any attempt to compile regional fertility data for the past 150 years will necessarily require the pulling together of a patchwork of very different data sources. The data sources and definitions are presented in Table 1 below, and discussed in greater depth thereafter. Whenever possible, we have attempted to remodel the historical data into the equivalent NUTS boundaries. Of course, this exercise requires a degree of geographical licence, and there will inevitably be some highly problematic cases, such as the inclusion of Vienna in Lower Austria in the pre-1930 data. However, for the purposes of this analysis, we seek to identify patterns of changes within a broadly defined set of boundaries over time. Therefore, rather than providing a continuous time series, we distinguish different time periods in which we can draw upon comparable data, both in terms of the regional set-up and in how the data was derived (see Table 1 for details). These time periods should be viewed as a discrete set of observations, and only a provisional view of the relative range and degree of convergence or divergence over time should be taken.

Period γ

Period γ covers the pre-1960 era for all of the three countries, and is examined using data collected as part of the Princeton European Fertility Project (PEFP). The PEFP was a path-breaking attempt to gather and analyse a wide set of demographic data relating to European fertility at the regional level over the 19th century, and up to 1960. Despite having been the object of considerable criticism (e.g. *Galloway et al.* 1994; *Brown/Guinnane* 2007), the Princeton dataset defined much of the European historical demography for the period 1850-1960, and has served as the basis for two of the most influential books of the history of European provincial fertility (*Coale/Watkins* 1986; *Watkins* 1991).

The project verified the presence of significant spatial differences in fertility across Europe during the last two centuries up to the 1960s, and discussed the reasons for these disparities (*Anderson* 1986; *Coale/Treadway* 1986). A main find-

Tab. 1: Measures and sources of sub-national spatial fertility information, German-speaking countries

Regional level	Period	Measure	Source
Austria			
Länder (approximately equivalent to NUTS-1)	γ (1880-1931)	Pseudo-TFR converted from I_t	Princeton European Fertility Project
Bundesländer (NUTS-1)	β (1960-2008)	TFR	Statistik Austria
Germany			
Staaten/Regierungsbezirke (approximately equivalent to NUTS-2)	γ (1880-1931)	Pseudo-TFR converted from I_t	Princeton European Fertility Project
<i>West Germany</i>			
Bundesländer (NUTS-1)	β (1950-1987)	TFR	Statistical Offices of Länder
<i>East Germany</i>			
Bezirke (approximately equivalent to NUTS-2)	β (1962-1987)	TFR	Statistisches Jahrbuch der Deutschen Demokratischen Republik
<i>Germany (Unified)</i>			
Bundesländer/Regierungsbezirke (NUTS-2) ¹	α (1991-2007)	TFR	Statistisches Bundesamt, Wiesbaden, 2009
Switzerland			
Cantons (NUTS-3)	γ (1860-1960)	Pseudo-TFR converted from I_t	Princeton European Fertility Project
Cantons (NUTS-3)	α (1981-2008)	TFR	Swiss Federal Statistics Office

¹ Due to a lack of time line data we included for Brandenburg only data for the state level (NUTS-1) and not for the two NUTS-2 regions, which were created in 2007. Also for Saxony-Anhalt we only provide NUTS-1 data for the state, and not for the Regierungsbezirke Dessau, Halle and Magdeburg, which existed until 2004.

ing was that spatial differences in Europe are persistent over time, but had become somewhat smaller during the first demographic transition. The marital behaviour played an important role, but cannot entirely explain these regional variations. For example, particularly in the early and middle phases of the first demographic transition (1900), there were large differences in marital fertility between the provinces in some countries, but variations in the proportion of married couples was also responsible for differences in the overall fertility in many other countries.

While data relating to marital fertility are available for period γ (as I_g), we chose to employ the overall index of fertility (I_f), as it removes one extra layer of assumptions regarding these estimates. Second, the output of the PEFP was the development of a ratio of the number of births of women in a given region and calendar year in relation to the number of births given the Hutterite standard of uncontrolled fertility. A simple procedure, described by *Sardon* (1996), can be followed to convert this ratio to something similar to the total fertility rate (TFR). For the conversion to be meaningful, the following equality must first be supposed:

$$\frac{B_{OBS}}{B_{HUT}} = \frac{TFR_{OBS}}{TFR_{HUT}}$$

where:

B_{OBS} = number of births observed in the population studied

B_{HUT} = number of births in the population studied with the Hutterite family schedule.

hence:

$$\frac{\sum_i F_i^n f_i^n}{\sum_i F_i^n h_i^n} = \frac{\sum_i f_i^n}{\sum_i h_i^n}$$

where:

F_i^n = population of women aged i in year n

f_i^n = fertility rate at age i in year n

h_i^n = Hutterite fertility rate at age i

This expresses the fact that "the relation between the observed number of births and the number expected if the Hutterite fertility rates are applied is equal to the equivalent relation between observed and Hutterite fertility rates" (*Sardon* 1996: 253). It therefore follows that

$$TFR_{OBS} = \left(\frac{B_{OBS}}{B_{HUT}} \right) \times TFR_{HUT} = I_f \times TFR_{HUT}$$

or, one can multiply the I_f by the Hutterite TFR of 12.44 in order to find the TFR of the population observed. *Sardon's* paper tested the veracity of this process by re-estimating observed TFRs using this method and found the results to be "not bad" (257).

Period β

For East Germany, we were able to supplement the PEFP and recent data by extracting fertility rates from published Statistical Yearbooks. We obtained the TFR rate at the *Bezirk* level for the period 1962-1987. For West Germany, we contacted individual statistical offices, of which many were able to produce long-run datasets of TFR. Thanks to the efforts of Statistik Austria and the Vienna Institute of Demography, we were able to secure a series of TFRs for Austria at the *Bundesland* level for the period 1960-2008. We have inserted an individual point estimate made for Vienna in 1951 (*Gisser* 1975). For Switzerland, we were unfortunately not able to obtain adequate data at the canton level for this period.

Period α

For this final period, we were able to access TFRs published by national statistical offices and Eurostat. While the period TFR has been rightly criticised as a misleading measure in recent times (*Sobotka/Lutz* 2009), it is still the foundation of our modern measurement of fertility. As such, this is the measure which both individual statistical offices and Eurostat use as the basis for delivering information on regional-level fertility. The more general issues regarding the fertility data quality for the modern period are examined in greater depth in *Kreyenfeld et al.* (2011 in CPoS 36,2-3).

It is clear, therefore, that the data employed in the time periods α , β and γ , respectively, are very different from each other in respect to the spatial integrity, nature and form of the data. As the goal of this exercise is to examine the *relative* differences in regional fertility rates at given points in time, we have decided not to try and force these three disparate datasets into one continuous time series. Instead, we will examine each dataset as a reflection of a discrete period in time. After taking into account the various inadequacies of each of the datasets – especially the possible errors in estimation in period γ and the period-quantum effects (*Sobotka/Lutz* 2009), which would be particularly prevalent in period α – we can attempt to observe some historical patterns over time, which may enhance our understanding of contemporary differences.

3.3 Measuring convergence over time

Convergence of the variation of an attribute over time can be measured in a variety of ways, but the most standard measure is to gauge the σ -convergence, or overall convergence, while accounting for the fluctuating mean. In order to test for σ -convergence in this paper, we have used the measure of coefficient of variation (C_v), which has also been employed in other studies of regional change in fertility (e.g. *Coleman* 1993). This is calculated as

$$C_v = \frac{\sigma}{\mu}$$

which is the standard deviation divided by the mean: if complete homogeneity is achieved, then $C_V = 0$. This measure has been used because it represents the simplest way to account for the fluctuation of the mean.

There are benefits and drawbacks when using this particular measure. On the positive side, the C_V measure ignores fluctuating means by treating each sequential period observation as entirely independent. However, during the course of fertility transition, it is of course highly likely that these temporally juxtaposed observations of any region k are in fact related, given the effect of the *timing* of the onset of decline on its *trajectory*. Despite this problem, we believe that C_V still offers a useful way to present a mainly descriptive account of spatial fertility variability over a long period of time.

3.4 Austria

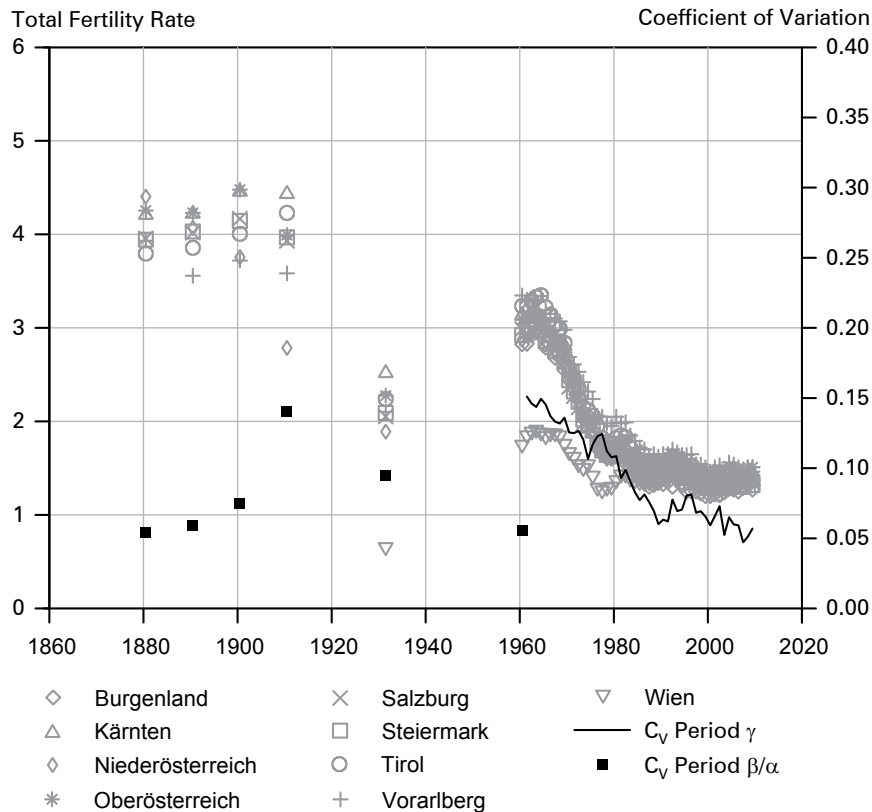
The Austrian dataset is unusual in that it broadly maintains the spatial integrity of the *Bundesländer* over time, although it should be noted that the pre-1930 data for Lower Austria include Vienna, and that data for Burgenland are not available until 1960. In terms of convergence, the inclusion of Vienna in Lower Austria potentially masks an important outlier in the 19th century. In general, we can distinguish three periods in the development of the C_V . A period of little change prior to the onset of the first demographic transition is followed by an era with quite substantial divergence lasting until the period around World War I. Since then, there has been a striking degree of convergence over the past five decades. Indeed, there appears to be clear evidence of convergence upon the Viennese rates.

The history of the regional characteristics of Austrian fertility using the PEPF data has been described by *Paul Demeny* and as part of the Graz Austrian Fertility Project (*Demeny* 1968; *GAFP* 2010), as well as in a recent PhD thesis (*Gude* 2010). Historically, of course, separating Austria from its wider imperial context can be quite difficult. Indeed, the Austro-Hungarian Empire was located to both the east and the west of the so-called "Hajnal line" which demarcated the "European marriage pattern" (*Hajnal* 1965). With regard to this demarcation, it is important to note that particularly Vienna and Lower Austria received substantial in-migration from the eastern territories of the Austro-Hungarian empire in the late 19th and early 20th centuries. Contemporary Austria is, however far smaller, and more homogenous. Furthermore, the social policy framework of Austria is generally determined in Vienna, rather than at the sub-national level of the federal states.

Despite this, a number of important and distinct patterns emerge. In particular, the extraordinarily low fertility of the city of Vienna in the 1930s is notable, with the number of women aged 25 to 30 being more than three times larger than the number of girls aged zero to five. Indeed, the Viennese TFR in 1934 was just 0.606 (*Lutz/Hanika* 1989), rising only to 1.11 by 1951 (*Gisser* 1975).

The trajectory of post-WWII Viennese fertility is, however, particularly interesting. From the 1960s onwards, fertility in Vienna was much lower than in the rest of Austria, until the other federal states of the country broadly converged at the capital's levels from the mid-1980s to the present day. It is worth now to consider

Fig. 1: Sub-national fertility variation in Austria 1880-2009, NUTS-2



Notes: For C_v figures, see Appendix III.

Source: Princeton European Fertility Project; Vienna Institute of Demography/Statistik Austria

the relationship between the Viennese and other regional fertility rates over the past few decades. In 1987, Burgenland became the first federal state to report a lower TFR than Vienna. Indeed, if we focus on the period after this change, we can see that Burgenland consistently reports the lowest fertility in the country, and that especially in the post-2000 era, Vienna's fertility rates have been undercut by other federal states, notably Styria and Carinthia. In 2003, Vienna reported the second highest fertility rate of all Austrian federal states. However, a more in-depth analysis of the characteristics of fertility in Vienna is made possible by the city's *Geburtenbarometer*, which shows the important effect of international migration. Indeed, *Zeman* calculated that migrant women in Vienna have contributed around 0.3 to the city's TFR in absolute terms between 2002 and 2008. For the rest of the country, the net contribution of migrants was just 0.12 in 2008 (*Zeman* 2010). Taking into account our theoretical discussion mentioned above, however, we might also suggest that the improved material infrastructure for families in Vienna may have had an impact on fertility.

3.5 Germany

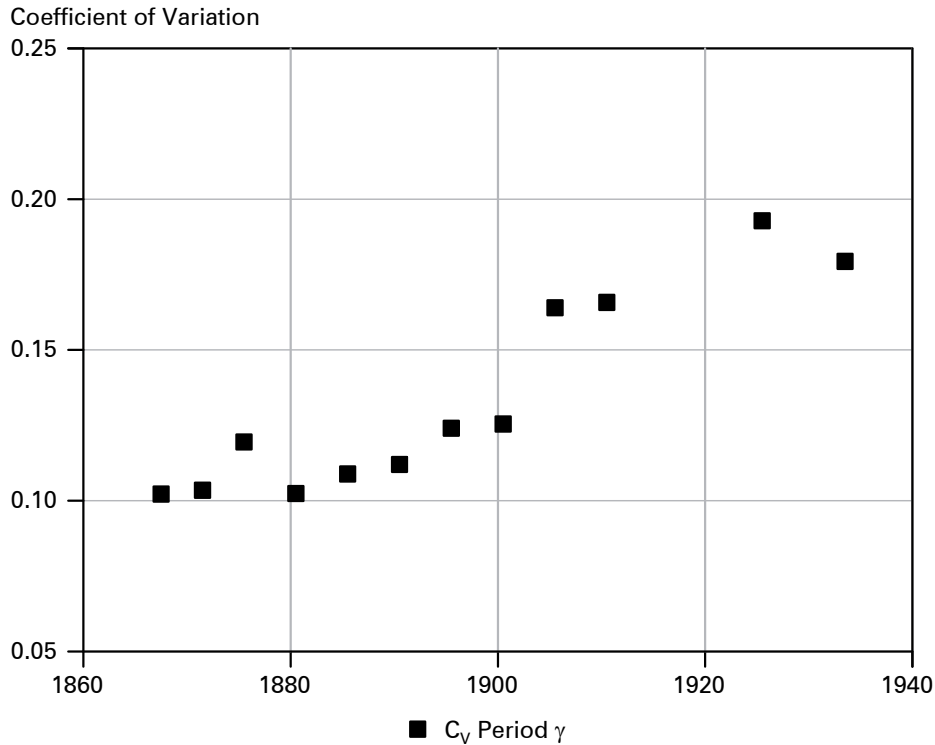
In the case of Germany, we were faced with particularly severe data constraints. While for the period prior to 1945, data at the state level and the *Regierungsbezirk* level (~NUTS-2 level) can be obtained from the Princeton Fertility Project, data are particularly scarce for West Germany between World War II and 1989. For East Germany, we have data for the *Bezirke* (~NUTS-2 level), while for West Germany we could only derive data at the NUTS-1 level. For the period from 1991 onwards, we were again able to use detailed NUTS-2 level data at the levels of *Regierungsbezirke* and the small federal states. With respect to the last 60 years, this section on Germany will mainly focus on differences between East and West Germany, while a more detailed look at factors of regional fertility differences will be provided in the case study on Lower Saxony and Bremen.

Like Austria and Switzerland, Germany has experienced quite a substantial divergence trend in spatial fertility variation in the early period of the first demographic transition (see Fig. 2). As rural, and particularly rural Catholic, areas tended to lag behind in this process, at least temporarily, the differences increased along the axes denoting the degree of urbanisation and the share of Catholics (see *Klüsener/Goldstein 2012*). This can also be seen in Appendix II, where the cities of Berlin, Hamburg and Bremen, as well as the highly urbanised and secularised state of Saxony, were pioneering this process; while predominantly rural areas, such as Bavaria or the western part of Lower Saxony (Oldenburg/Osnabrück) lagged behind. The process culminated in the 1930s, when similarly to Vienna, the big cities reported TFRs well below sub-replacement levels.

The following decades were characterised by a kind of rollercoaster pattern in the period fertility rates (particularly in East Germany). The cohort fertility rates, on the other hand, remained rather stable at around 1.8 for the East German cohort born between 1945 and 1960, while West Germany experienced a decrease to levels of around 1.6 (*MPIDR/VID 2010*). The increase of the 1930s occurred parallel to the introduction of pro-natalist policies by the Nazi regime (*Pine 1997*). After a sharp decline caused by the war, the period TFR increased again in the 1950s, when even Berlin reported levels of around 2.0. Unfortunately, due to data scarcity, we are not able to calculate the C_v for this period.

In both parts of Germany, the late 1960s and early 1970s were characterised by another sharp fertility decline with surprisingly few differences in the temporal trajectories of the West and East German regions. The decline took place within a period of ten years, while in the late 19th century, the onset of the fertility decline lagged by more than two decades in some regions. From the 1970s onwards, the period fertility rates stabilised in West Germany, while East Germany experienced another period with a sharp fertility increase. *Buttner and Lutz (1990)* provided empirical evidence that this can be mainly attributed to pro-natalist family policies, which were enacted in the GDR in the late 1970s. This led to a substantial divergence of TFRs between West and East Germany, while within the two states, regional values converged. But the increase observed in East Germany was short-lived, and was followed by a sharp decline in the transition crises in the 1990s, which partly even

Fig. 2: C_V – Sub-national fertility variation in Germany 1867-1933, PEFT provinces (excluding territories East of Oder-Neiße-border)



Notes: For C_V figures, see Appendix III.

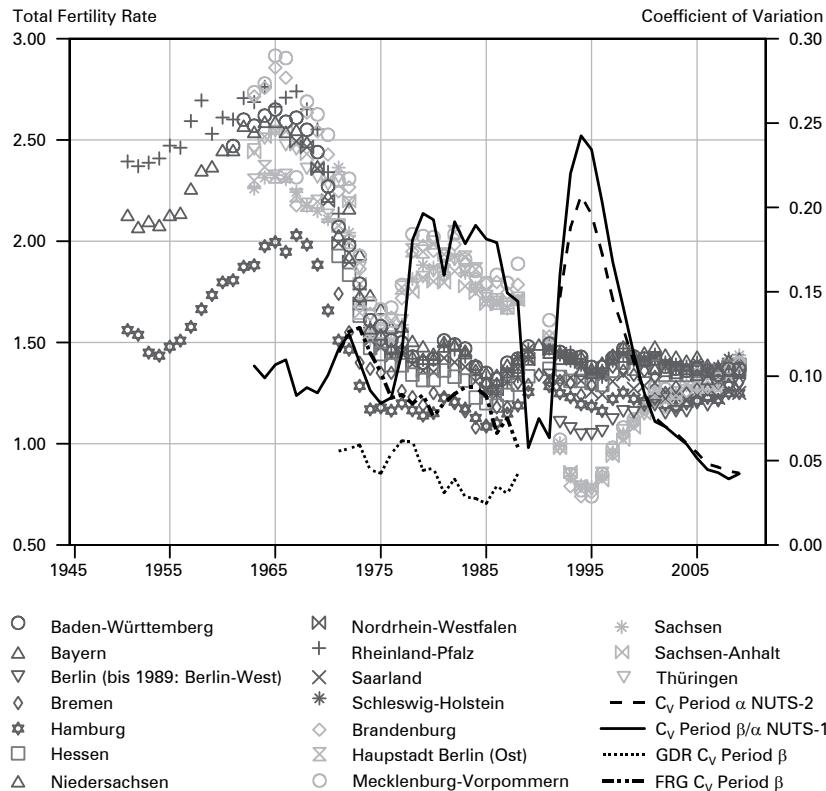
Source: Princeton European Fertility Project

affected cohort fertility rates. This again led to a divergence of West and East Germany.

Owing to missing data in Period β , we were only able to calculate a meaningful C_V measure *within* East and West Germany for the period 1970-1987. In Figure 3, we can observe that the C_V was greater in West Germany, and that, hence, the country was more regionally heterogeneous than East Germany.

In recent years, period fertility differences between Eastern and Western Germany have converged again, but some researchers (Goldstein/Kreyenfeld 2011) believe that we will see another divergence trend in the future. This assumption is based on the expectation that East German TFRs are likely to increase to higher levels than those in Western Germany over the medium term. This expectation is based on two observations: First, East German attitudes to family formation are much less traditional than those of West Germans, which can be seen, for example, when considering the high number of births outside marriage (Klüsener/Kreyenfeld 2009). Additionally, access to child care is much better in Eastern Germany than in Western Germany.

Fig. 3: Sub-national fertility variation in Germany 1950-2008, NUTS-1 (West Germany in grey, East Germany in light grey)



Notes: East German Bezirke have been aggregated to their equivalent NUTS-1 region. For C_v figures, see Appendix III.

Source: West Germany – Statistische Landesämter; East Germany – Statistisches Jahrbuch der DDR; Germany since 1991 – Statistisches Bundesamt

3.6 Switzerland

In contrast to Germany and Austria, regional identities in Switzerland are rather anchored at the NUTS-3 level, which comprises the Swiss cantons. This is also important because policy distinctions are made at the cantonal level.

Figure 4 shows the sub-national patterns of fertility in Switzerland at the NUTS-3 level from the mid-19th century to the present day. In Period γ, the lowest fertility can be found in the primarily urban cantons of Geneva, Basel, Neuchatel and Zurich. In 1920, for example, while *Basel-Stadt* saw a nominal TFR of 1.3, the surrounding canton of *Basel-Landschaft* had a fertility rate that was almost twice as high. High fertility appears to be concentrated in Appenzell-Ausserrhoden and Appenzell-Innerrhoden, Nidwalden, Uri and Obwalden; i.e. an area concentrated around the centre and the east of the country. Lesthaeghe and Wilson observed that, as in

many other European countries, the decline of marital fertility in Switzerland during the period 1860-1920 can, at least in part, be associated with household economic circumstances and secularisation (*Lesthaeghe/Wilson 1986*).

With regard to divergence and convergence, the Swiss dataset is particularly interesting, as it is the longest time series available to us. The data go back to 1850. Figure 4 shows that in the period prior to the first demographic transition, a convergence process took place within the country. With the onset of fertility decline, the rates diverged, as urban areas again experienced the decline first, reaching the highest levels in the 1920s and 1930s. Since then, the rates have again converged, with a very significant level of convergence occurring in recent decades. As well as identifying σ -convergence, we can also identify β -convergence, with the sharpest drops seen in areas of high fertility in 1980, while cantons with a low fertility in 1980 have either remained stable, or experienced a slightly increasing fertility rate.

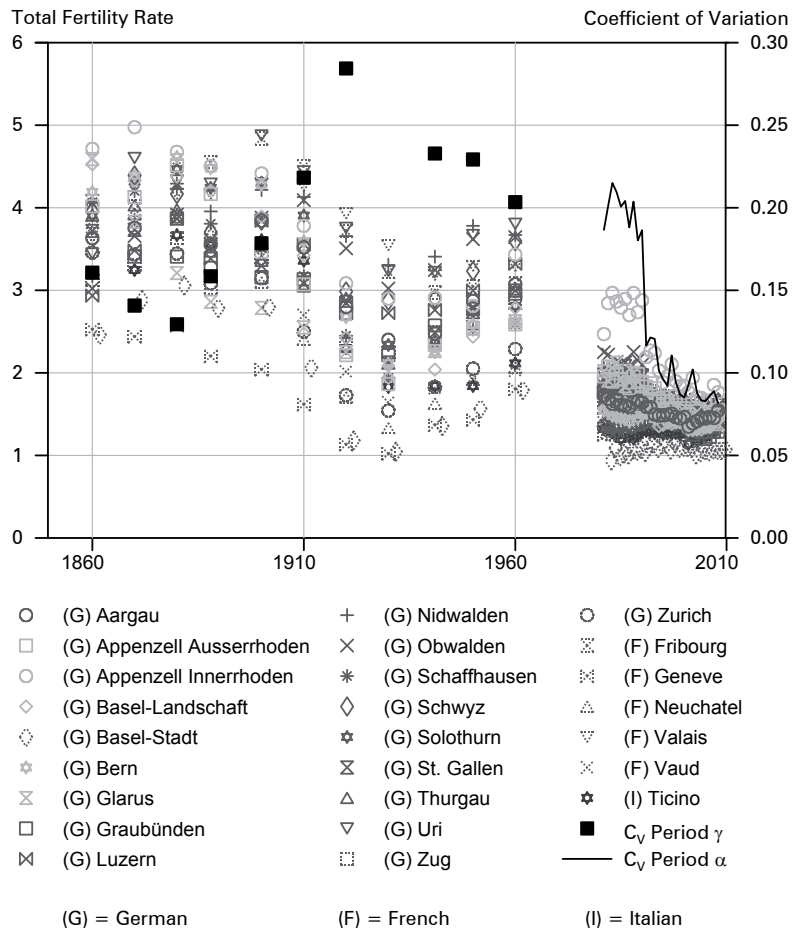
In order to better understand these variations in fertility, we need to examine the similarities and differences between cantons. Cantons share broadly similar living conditions; there are no labour market barriers between them, and federal law regulates many aspects of the daily life. Indeed, it has been argued that the cultural and religious diversity of the country no longer has a strong impact on fertility (*Wanner 2004*). There are, however, very striking differences in terms of employment, particularly agricultural employment. In Appenzell-Innerrhoden, for example, over 20 % of the population was active in agricultural employment in 2001, compared to almost none in *Basel-Stadt* and Zurich. Furthermore, differential fertility between native and immigrant populations, as identified by Wanner, plays an important role in shaping the fertility landscape of some cantons, particularly urban ones (*Wanner 2002*).

Finally, a number of studies have identified the significant difference in family policies between cantons (*Vatter 2002; Armingeon et al. 2004*), and how these might be linked to differential fertility (*Bonoli 2008*). Indeed, the monthly amount of a standard child benefit varies between 150 and 300 Swiss francs, depending on the canton of residence, and similar differences can be seen when comparing the extent of childcare services. Especially, Catholic cantons tend to have the most generous family benefits, but invest fewer resources in childcare. Meanwhile, *Armingeon et al.* (2004) found that the relative strength of the left in cantonal politics was associated with both more generous family benefits and better child care services.

A regression analysis by *Bonoli* proved that there is an interaction of a number of different factors in different cantons. First, the process of de-agrarianisation is very important. Second, *Bonoli* suggested that the presence of day care centres, which are mainly concentrated in the urban cantons, may have played a role in keeping fertility rates in these areas stable between 1980 and 2000. Finally, the study found a moderate but statistically significant effect of the level of family benefits on fertility by canton. This echoes not only the theoretical section above, but also other studies, particularly from Spain (*Baizán 2009*) and Norway (*Kravdal 1996*).

Bonoli (2008: 74) concluded: "Both old and new determinants seem to be playing a role simultaneously in explaining change in fertility. On the one hand, societal modernisation, measured with the decline in agricultural employment, is a statisti-

Fig. 4: Sub-national fertility in Switzerland 1860-2008, NUTS-3



Notes: For C_v figures, see Appendix III.

Source: Swiss Federal Statistics Office, Princeton European Fertility Project data

cally significant predictor in all models. On the other hand, the new determinants, child care availability and the generosity of child benefits, remain significant predictors even after controlling for the effect of societal modernisation". Of course, *Bonoli* is quite right to point out that "[f]ertility decisions are unlikely to be the result of rational calculations where a few Swiss francs variation in family benefits can be important"; and that the family policies, together with "a general policy climate that is more favourable to the reconciliation of work and family life", play crucial roles *Bonoli* (2008: 74).

3.7 Convergence?

The evidence presented above strongly suggests that convergence is the dominant theme of sub-national fertility over recent decades, particularly when examined at the various NUTS levels. Table 2 shows 18 European countries with more than five NUTS-2 regions and the available data for comparing the C_v in the early 1990s with the latest data (2004-2008). Over this period, fertility differences between NUTS-2 regions, at least measured by the C_v , have decreased in 15 of the 18 countries.

However, as we have already shown, none of the NUTS levels is an appropriate level for considering the effects of both cultural and policy differences on fertility in all countries. Significant differences *do* still exist, and if we are to move beyond what *Sobotka* (2002) calls “substantively empty mechanistic views of fertility change” in order to “try to obtain interdisciplinary and theory-driven explanations”, it is necessary to develop a more nuanced and less universalist approach (208). This may, as we have seen, mean examining the different sources of data in different ways for different countries.

Tab. 2: Comparing C_v for sub-national TFRs in 18 European Countries, NUTS-2

C_v 1991-1995		C_v 2004-2008	
18 countries (unweighted)	0.199	Spain	0.124
<i>Germany</i>	0.183	Portugal	0.118
Italy	0.167	Bulgaria	0.111
Spain	0.162	Greece	0.104
Portugal	0.138	Finland	0.098
Czech Republic	0.136	Italy	0.097
Bulgaria	0.135	18 countries (unweighted)	0.088
Poland	0.126	Czech Republic	0.086
Hungary	0.101	Belgium	0.085
<i>Switzerland</i>	0.093	Poland	0.081
Sweden	0.088	Netherlands	0.078
Netherlands	0.085	Hungary	0.075
France	0.078	France	0.067
Belgium	0.075	Denmark	0.062
Norway	0.074	<i>Switzerland</i>	0.058
Greece	0.074	Norway	0.057
Finland	0.073	<i>Austria</i>	0.056
<i>Austria</i>	0.072	<i>Germany</i>	0.049
Denmark	0.057	Sweden	0.042

Notes: Only countries with at least 5 NUTS-2 regions included.

Source: Eurostat, Statistical Offices, MPIDR Rostock

3.8 Divergence within Convergence – Contrasting the City of Bremen and the State of Lower Saxony

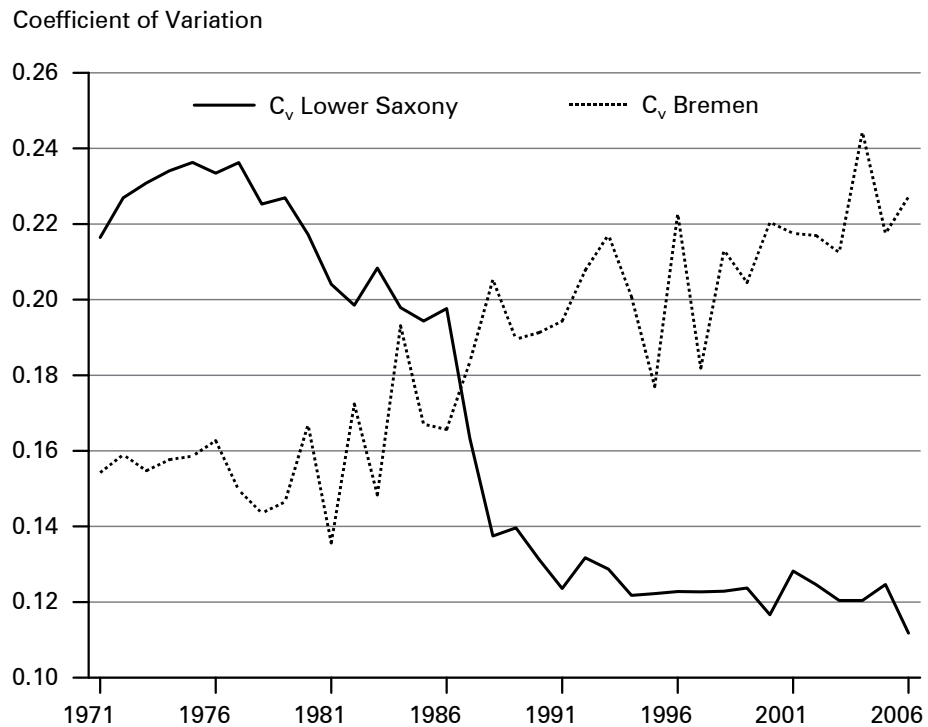
The preceding section has shown that the sub-national fertility trends at the macro-regional level in Austria, (West and East) Germany and Switzerland have been characterised by a process of convergence in recent decades. In this section, we will turn to an exemplary analysis of more detailed geographic data, which will illustrate that the observation of convergence does not necessarily hold at a lower geographic level.

The study area of Lower Saxony and the city of Bremen comprises 8.5 million people, or around 1/10th of the German population. This is comparable to the populations of Austria (8.4 million) and Switzerland (7.8 million). Both for Lower Saxony and Bremen, we have TFR data available for the period 1971-2006 on a small geographic scale. This area of Germany is of particular interest, as it exhibits the highest diversity in regional fertility levels, at least in Western Germany. The western part of Lower Saxony (areas around Oldenburg and Osnabrück) which borders the Netherlands has reported the highest period TFRs in Germany for decades (see also Appendix I). In the beginning of the 1970s, many municipalities had rates above 3.0, while today's levels are 1.6-1.8 – which is well above the German average. The area is rather rural and predominantly Catholic. The eastern part of the state (e.g. areas around Hannover and Braunschweig), meanwhile, saw period fertility levels below replacement level in the 1920s (see Appendix II). Today, that area is among the Western German regions with the lowest fertility levels and the highest old-age dependency ratios.

The principal unit of investigation for Bremen are the city districts, while for Lower Saxony it is the municipalities and unified rural communities (*Samtgemeinden*). In order to have at least 1,500 females of reproductive age in each of the units during the whole study period, some smaller units have been amalgamated, while some larger units have been subdivided based on a set of rules (see *Klüsener 2009* for details). In addition, some problematic units were excluded from the analysis. In total, for Bremen we have data for 28 units, while Lower Saxony is subdivided into 255 units. The geographic extent of each observed unit is time-constant over the period studied.

We first contrast the C_v development of the local TFRs of Lower Saxony and Bremen, which is displayed in Figure 5. The figure for Lower Saxony shows a very similar pattern to that observed for the NUTS regions of Austria, Switzerland and both West and East Germany. Since the mid-1970s, the values have converged, with the line being particularly steep in the period 1986-1988. This was a time in which the period TFR of many big urban areas saw substantial increases, while the levels of rural areas continued to decrease. The family policy reform of 1986 might have played a role in this trend (*Klüsener 2009*).

Within the city of Bremen, on the other hand, we can observe a divergence trend since the mid-1970s. *Klüsener (2009)* identified three main mechanisms which fostered this trend. All are at least partly connected to selective migration and spatial segregation processes. The first is a long-lasting structural economic crisis, which

Fig. 5: Divergence within convergence: C_v in Lower Saxony and Bremen

Source: Statistical Offices of Lower Saxony and Bremen, own calculations

started in the 1970s and has not yet been overcome. As a result, quite substantial pockets of economically deprived actors can be found today in the working-class districts of the city. The second is a dramatic expansion of the tertiary education institutions, which led to an increase in the number of students studying at tertiary institutions, from 3,000 in 1970 to almost 30,000 in 2006. This influx of students led to tremendous social changes, particularly in those districts close to the tertiary education institutions. The third is a paradigm change in housing preferences, which resulted in a gentrification process in the city districts around the city centre. Today, several "gentrified academic" districts of the city of Bremen report TFR levels well below 1.0, while in other districts we observe levels above 1.6. It would be interesting to investigate whether these local "hot spots" of period lowest low fertility have a contextual impact on the fertility decisions of actors who have spent at least parts of their lives in these areas.

For Lower Saxony, we also have a number of structural variables available which might influence fertility levels.² This allows for an examination of potential associations between fertility trends and these structural variables. In an effort to avoid ecological fallacies, we do not simply interpret these associations to hold at the individual level.³ Moreover, we will also refrain from setting up sophisticated models because of the limited time-series data availability. An introduction to spatial panel modelling techniques would also go beyond the scope of this paper. We will therefore focus on descriptive findings, and point out potential challenges of attempts to implement causal modelling of the processes observed.

First, we will examine whether the convergence pattern observed in the fertility development can also be observed in the structural factors which we have available (see Fig. 6). Among these indicators, “child care” and a longer time series with unemployment data are only available at the district level. The child care data were only available for 1986, 1994, 1998 and 2002, so these data were interpolated.

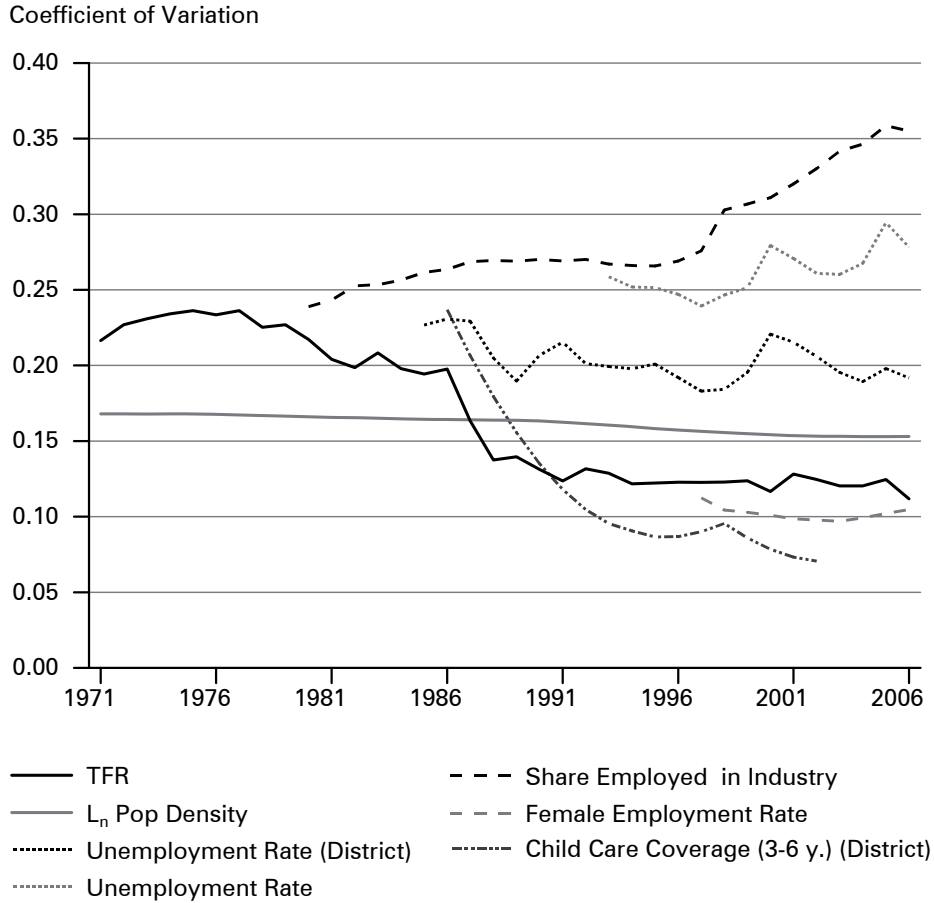
With regard to the economic indicators, these appear to have remained rather stable over time, with exceptions being the share of employees in the industry and the local unemployment levels, which have registered a divergent trend since the mid-1990s. The graphs give no indication that there is a strong relationship between economic divergence and convergence trends and the convergence trend of the TFR. The same is true for population density (this variable has been log-transformed, as it is highly left-skewed).

While a substantial convergence trend can be observed in the child care variable, it is very questionable whether a causal link between convergence in child care and the convergence in fertility levels could be easily established. One major challenge is illustrated in Figure 7, which shows the rather unusual positive ecological association between TFR levels and child care coverage for 1986. But this pattern did not hold for long. By 2001, it had changed to the more common picture of a strong negative ecological association. In our opinion, the pattern of 1986 is largely an artefact created by local planning institutions. In recent decades, the expansion of child care did not follow the principle that child care should be developed in those areas where the demand for child care was highest. Planning was in the responsibility of the local administration, and little strategic planning took place, at least until the early 1990s (Jaich 2003). It was usually either based on the number of children in the respective age groups, or on the number of births observed, which provided a rough estimate of the short-term future demand.

² A more detailed discussion of the Bremen case can be found in Klüsener 2009.

³ An “ecological fallacy” is a potential error in the interpretation of statistical data in an ecological study, whereby inferences about the nature of specific individuals are based solely upon mean values for the groups to which those individuals belong. If such groups display high internal heterogeneity in the variation of the attributes of interest, such an inference might not hold at the individual level. However, in spatial analysis, the risk of making an ecological fallacy error is dependent on the size of the region, as populations become usually more homogenous, the smaller the unit of observation (Carstairs 1981).

Fig. 6: Lower Saxony: C_v of developing structural factors

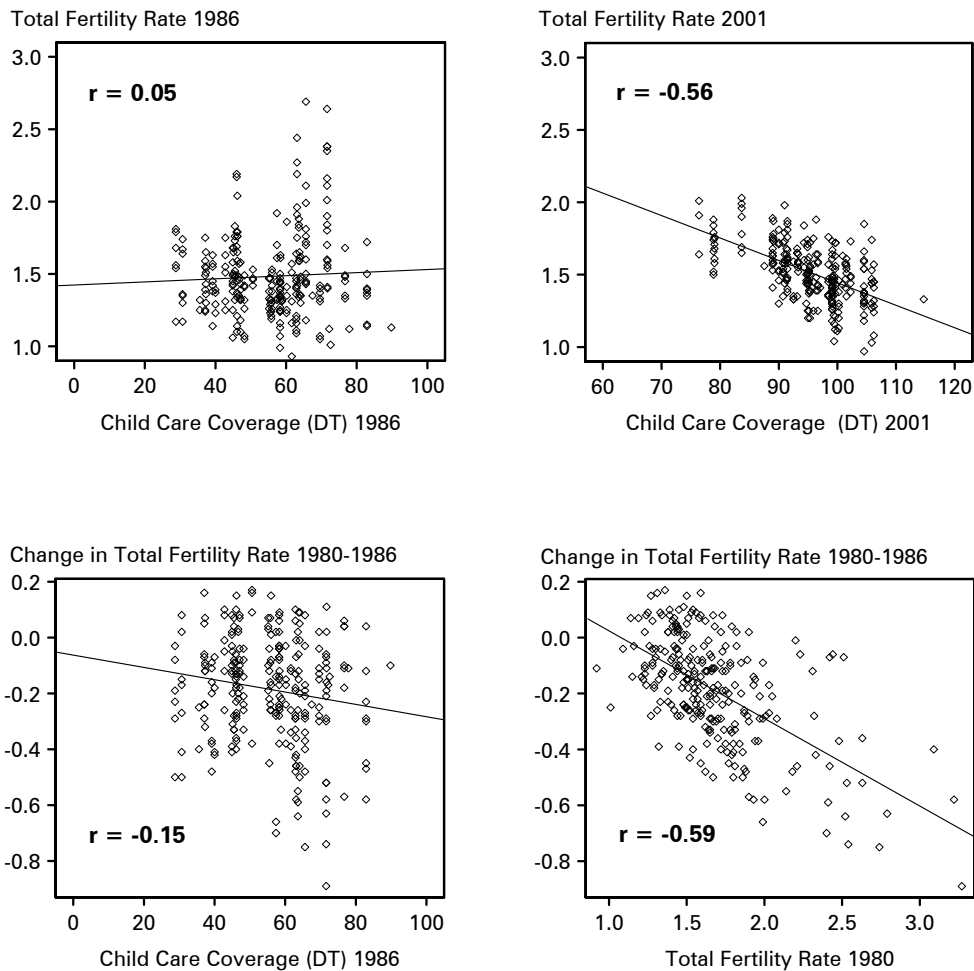


Source: Statistical Offices of Lower Saxony and Germany, own calculations

As there usually is a lag of several years between local planning activities and the construction and opening of child care institutions, the coverage is to some extent influenced by the fertility levels that existed some years earlier. As a consequence, in periods of rapid expansion, such as the 1970s and 1980s, this impact is likely to be higher in those areas where the fertility decline occurred later, while it is likely to be lower in areas which had already reached a low fertility level. As a result, child care coverage is associated with lagging fertility changes (see the second graph on the left column of Fig. 7), which is likely to cause endogeneity challenges in any causal analyses.

In order to examine the association between economic trends and fertility levels (see Section 2.2) we will study the ecological relationship between unemployment

Fig. 7: Child care coverage and TFR (Lower Saxony)

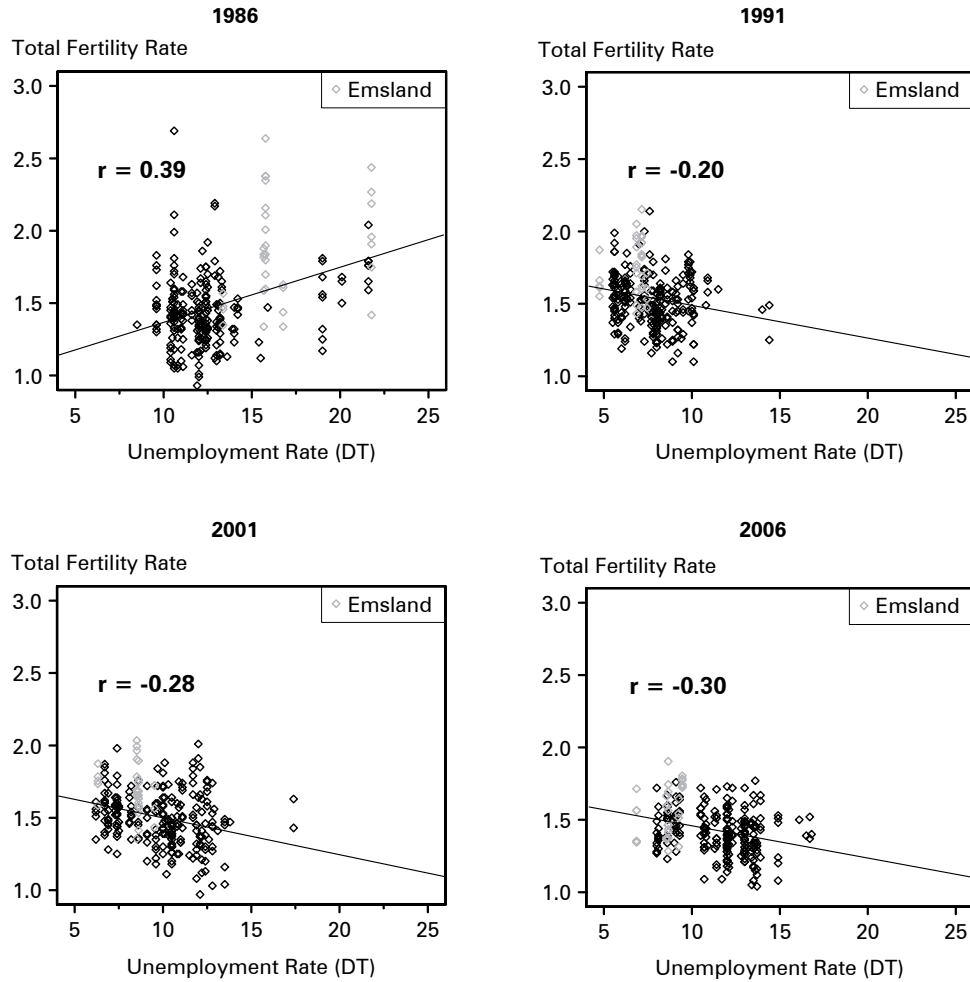


Notes: DT stands for district as these data are only available at the district level.

Source: Statistical Offices of Lower Saxony and Germany, own calculations

and fertility levels (see Fig. 8). The high fertility areas in the western part of Lower Saxony (see Appendix I) appear to be very unusual in terms of the economic development observed over the last 30 years. In the 1970s and early 1980s, this area, which is also called "Emsland", was characterised by very high unemployment levels between 15 % and more than 20 %. But this changed rapidly in the 1980s, also due to large-scale investments (Schrader *et al.* 2001), turning this area from a rather economically disadvantaged into a very prosperous region. These kinds of economic changes are rarely observed, and it is interesting to investigate whether this trend is associated to fertility levels.

Fig. 8: TFR and unemployment rate (Lower Saxony)

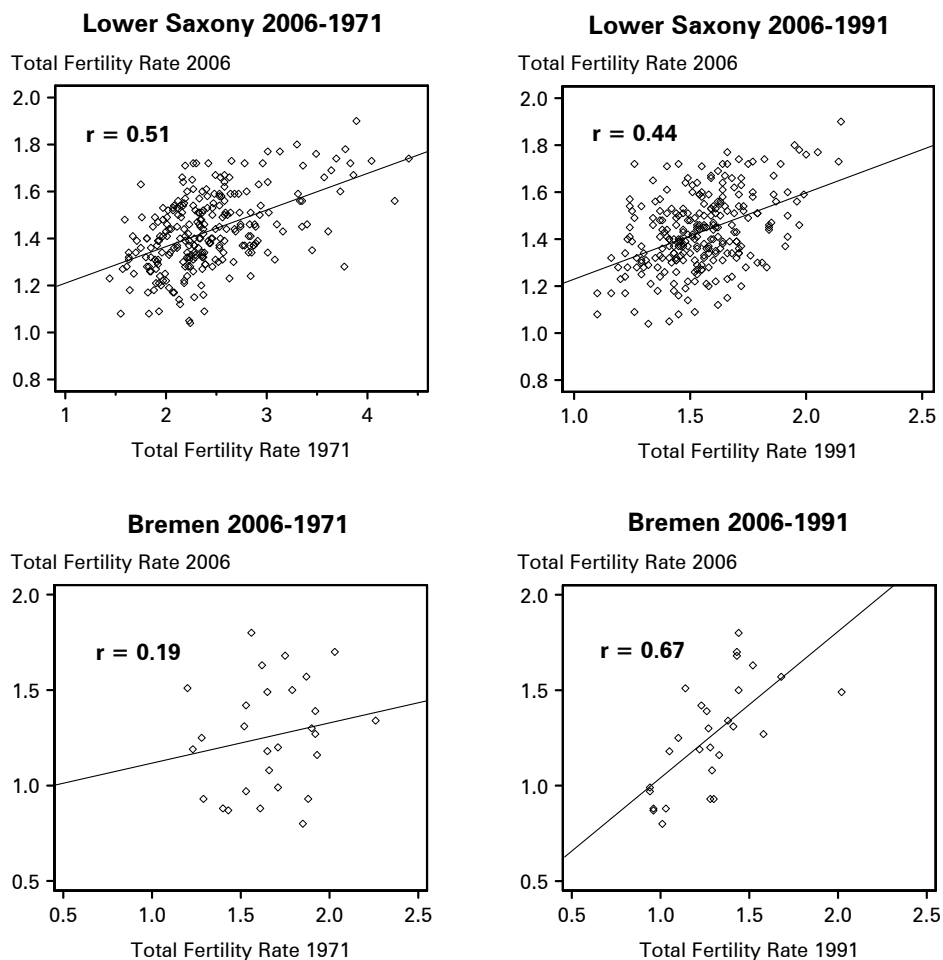


Notes: DT stands for district as these data are only available at the district level.

Source: Statistical Offices of Bremen, Lower Saxony and Germany, own calculations

The figure for 1986 shows that the areas with high fertility rates in the western part of Lower Saxony also had quite high unemployment rates, resulting in a positive ecological association between fertility and unemployment. When these pockets of high unemployment turned into areas with moderate unemployment rates, they continued to have higher fertility levels than the other units in Lower Saxony. As a result, the ecological association between unemployment levels and fertility became negative. The evidence suggests that, in this case, fertility in the western part of Lower Saxony is largely independent of the observed unemployment fig-

Fig. 9: Path dependency of local TFRs in Lower Saxony and Bremen



Source: Statistical Offices of Lower Saxony, Bremen and Germany, own calculations

ures. Further study in a multi-level framework that includes individual-level data is needed to provide a better understanding of this interesting change.

In Section 2.5, we noted that children usually grow up in the (local) social and economic setting of their parents, which makes it likely that they will adopt similar norms with regard to fertility decisions. This intergenerational transfer of norms makes cultural inertia very likely, particularly in regions with little in- and out-migration. In those regions, the fertility development should therefore exhibit a strong path dependency. The availability of long-term fertility data allow us to test whether

there are path dependencies in the spatial fertility variation of Bremen and Lower Saxony. In Figure 9, we present plots for Lower Saxony and Bremen, which contrast the fertility levels of 2006 with those of 1971 and 1991.⁴ In Lower Saxony, we find evidence for a quite substantial path dependency. We even get the surprising result that the values observed in 1971 are slightly stronger associated with the values of 2006 than the values of 1991. With regard to the city districts of Bremen, on the other hand, the levels of 1971 have very little to do with those of 2006. The processes which caused this change in the spatial pattern (expansion of academic institutions, gentrification) have been outlined above. But in 1991, the new spatial fertility regime had already been well established in Bremen, and since then has changed relatively little. The results show that the inner-city processes of polarisation and gentrification can change the fertility regime of localities. It is likely that this is mainly caused by selective migration processes, in which gentrifiers with high socio-economic status move in, while most of the former population with low socio-economic status are forced to leave these gentrified districts in response to rising housing prices.

Generally, our study of Lower Saxony and Bremen shows that fertility convergence at the regional level can coincide with fertility divergence on a smaller geographic scale. Given that many cities in Germany (*Friedrichs/Triemer* 2009), Austria (*Fassmann/Hatz* 2006) and Switzerland (*Rérat/Lees* 2011) have experienced gentrification and segregation trends in recent decades (*Krätke* 1995), internal patterns of divergence with regard to spatial fertility variation might also be found in other metropolitan areas of these three countries.

The findings also raise doubts about whether the fertility convergence is strongly linked with economic convergence trends, but we would need micro data to study this relationship in an appropriate manner. Based on the evidence, we would suggest that the TFR convergence pattern in Lower Saxony is caused by time lags in the onset of drastic fertility changes. In the case of the fertility decline in the 1960s and 1970s, the population of urban areas experienced the decline earlier than the usual laggards (rural population, Catholics). This does not mean that economic change is not affecting the results, but rather that spatial economic differences and spatial trends of economic divergence and convergence cannot be directly associated with the spatial divergence and convergence trends in fertility development, which are usually observed in such periods. We would, however, need better data and quantitative modelling to study these issues in greater detail.

4 Discussion and conclusion

In this paper, we first outlined some of the main theoretical elements which underpin our current knowledge of the social geography of fertility trends. By a multi-faceted empirical analysis of datasets which had not existed in this form so far (a compara-

⁴ It should be noted that, in Lower Saxony, we change the scale of the x-axis between the two upper graphs.

tive long-term dataset and two datasets at small geographical scale), we have then tried to show that sub-national spatial fertility variation in Austria, Germany and Switzerland are likely to be shaped by existing cultural, social and economic factors, but that they are also visible in and shaped by new developments.

In a European context, at least, European integration and globalisation have played significant roles in the homogenisation of cultures, economies, societies, languages, currencies and norms; and the freedom and capacity to travel, work and live within Europe has opened up new opportunities to migrate. As sub-national regions sometimes struggle to define and maintain their historical identity and integrity in the face of these challenges, both within their countries and within Europe as a whole, it is hardly surprising that NUTS-1 and -2 (and even NUTS-3) level fertility should reflect this kind of convergence.

By juxtaposing a historical outlook with a very focused small-scale case study, we suggest however, that over the past few decades, development processes within cities have fostered a degree of inner-city divergence which is, in turn, likely to continue in the future.

As such, “divergence within convergence”, despite a contradiction in terms, does seem to characterise the recent trends and likely future trajectories in sub-national fertility best. This is also supported by the observation that family formation and fertility behaviour has diversified at the individual level over recent decades (e.g. *Brückner/Mayer 2005*).

In this setting, the question of regional differences in fertility is therefore still on the agenda despite the macro-regional convergence. From studying the differences between and within German-speaking countries, we can see that dealing with regional disparities in fertility forces us to think about better theoretical models to improve our understanding of the complex interplay of different dimensions of the life course in societal contexts.

By using datasets with increasingly fine-graded geographic scale, we are able to gain a deeper understanding of the relationship between regional and local conditions and fertility decisions of humans. As discussed earlier, these include the material and institutional (infra-)structure, economic and socio-structural factors, cultural factors and the embeddedness in social contexts. The local conditions of organising a life course are considered as part of the *opportunity structure* of welfare production. Individuals are to a certain degree able to modify those conditions or to elude from them by moving to another region.

Finally, exploring the complex interrelationship between regional conditions, the fertility behaviour of the population and migration processes would require the framework of a *longitudinal perspective of analysis*. Ideally, these studies should be based on a combination of individual-level data and contextual data; for example, in Austria, such research could utilise future waves of the Generations and Gender Survey (GGS), while research on Germany could be based on future waves of the PAIRFAM study.

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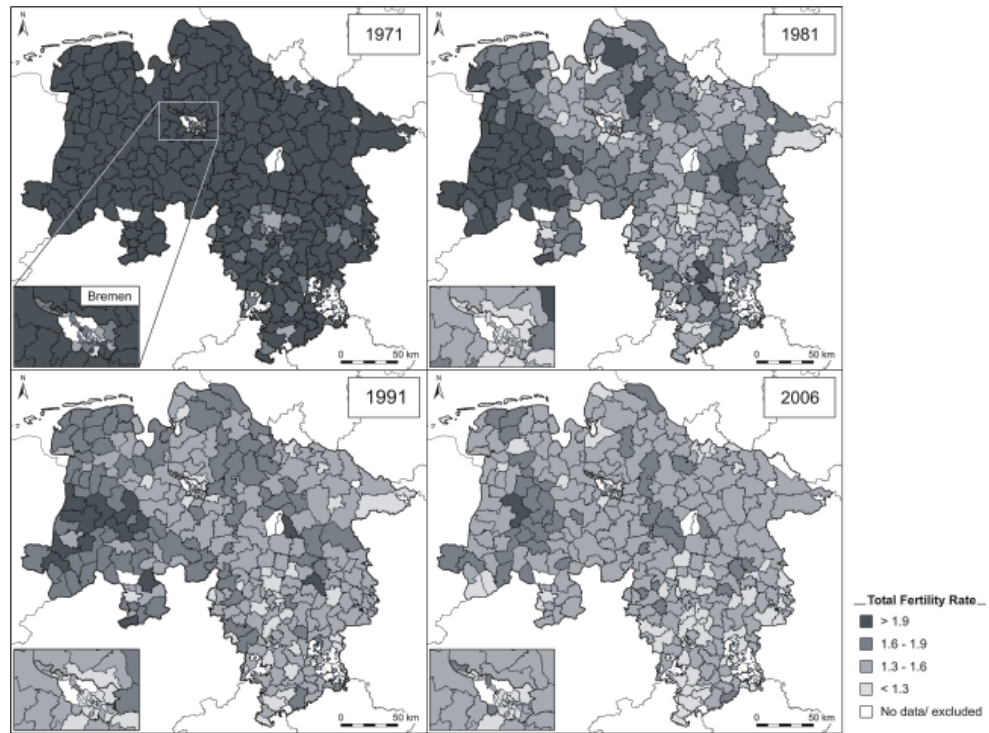
Dr. Stuart Basten (✉). Department of Social Policy and Intervention, University of Oxford, 32 Wellington Square, Oxford OX1 2ER, United Kingdom.
E-Mail: stuart.basten@spi.ox.ac.uk
URL: www.spi.ox.ac.uk

Prof. Dr. Johannes Huinink. Universität Bremen, Institut für angewandte und empirische Soziologie (EMPAS), 28359 Bremen, Germany. E-Mail: huinink@empas.uni-bremen.de
URL: <http://www.soziologie.uni-bremen.de>

Dr. Sebastian Klüsener. Max Planck Institute for Demographic Research, 18057 Rostock, Germany. E-Mail: kluesener@demogr.mpg.de
URL: <http://www.demogr.mpg.de>

In alphabetical order.

Appendix I: The Spatio-temporal Emergence of Sub-replacement Period TFRs in Lower Saxony and Bremen



Source: Statistical Offices of Bremen and Lower Saxony, own calculations; Base Map: Federal Agency for Cartography and Geodesy in Germany (2007), modified

Appendix II: Estimated TFR for German PEFT Provinces 1867-1933, ordered at 1933 (excluding territories East of Oder-Neiße-border)

PEFT Province	Indicative NUTS-1 Region	1867	1871	1875	1880	1885	1890	1895	1900	1905	1910	1925	1933
Berlin	BE	4.08	3.91	4.42	3.98	3.52	3.21	2.96	2.70	2.54	2.28	1.06	1.12
Hamburg	HH	3.63	3.92	4.34	4.23	4.01	3.99	3.89	3.36	2.96	2.61	1.47	1.42
Dresden	SN	4.50	4.59		4.79	4.69	4.55		4.34		3.07	1.80	1.48
Leipzig	SN	4.90	5.01		5.26	5.21	5.05		4.39		3.18	1.79	1.48
Zwickau	SN	5.91	6.00		6.03	6.05	5.81		5.16		3.68	1.97	1.48
Wiesbaden	HE	4.23	4.27		4.09	3.82	3.63	3.61	3.60	3.41	2.95	1.85	1.53
Bremen	HB	3.97	4.15	4.55	4.23	3.79	3.61	3.55	3.52	3.47	3.00	1.79	1.60
Hannover	NI	4.47	4.43		4.48	4.38	4.25	4.24	4.07	3.58	3.09	1.78	1.60
Lübeck	SH	3.82	3.92	4.29	4.23	4.13	4.03		3.84	3.64	3.13	1.92	1.63
Köln	NW	4.58	4.73		4.99	4.85	4.85	4.67	4.65	4.35	3.71	2.15	1.68
Neckarkreis	BW		5.22	5.81	5.29	4.78	4.42		4.23		3.55	1.94	1.72
Schaumburg-Lippe	NW		4.49		4.44	4.40	4.08		3.99		3.36	2.00	1.73
Düsseldorf	NW	5.05	5.22		5.35	5.22	5.06	4.96	4.98	4.74	4.04	2.11	1.74
Braunschweig	NI		4.48	4.91	4.63	4.59	4.55	4.43	4.23	3.74	3.27	2.10	1.77
Mittelfranken	BY	4.79	4.99	5.44	5.08	4.85	4.62		4.50		3.63	2.08	1.79
Oberbayern	BY	5.05	5.20	5.73	5.40	5.09	4.83		4.58		3.63	2.11	1.79
Rheinessen	RP		4.57		4.55	4.29	4.09	3.92	3.98	3.76	3.28	2.18	1.82
Starkenburger	HE		5.08		4.88	4.54	4.39	4.40	4.54	4.37	3.81	2.25	1.84
Arnsberg	NW	5.54	5.86		6.06	6.00	5.93	5.90	5.93	5.73	5.03	2.55	1.87
Magdeburg	ST	4.78	4.76		4.98	5.03	4.85	4.67	4.37	3.86	3.52	2.19	1.88
Thüringen	TH		4.73	5.13	4.85	4.88	4.78		4.65		3.82	2.40	1.88
Mannheim	BW		5.14		5.15	4.93	4.79		4.83		4.11	2.44	1.90
Karlsruhe	BW		5.25		5.04	4.69	4.43		4.49		3.83	2.38	1.92
Erfurt	TH	4.93	5.10		5.10	5.00	4.81	4.59	4.43	4.13	3.71	2.33	1.93
Potsdam	BB	4.73	4.71		4.98	4.85	4.73	4.35	3.76	3.20	2.60	2.03	1.94
Anhalt	ST		4.76	5.16	5.00	5.04	4.95		4.47		3.42	2.39	2.00
Lippe	NW		4.73		4.94	4.89	4.89		4.65		4.09	2.46	2.00
Minden	NW	4.78	4.80		4.99	4.94	4.84	4.80	4.71	4.43	3.97	2.46	2.00
Oberhessen	HE		4.43		4.30	4.06	3.86	3.86	3.82	3.69	3.42	2.45	2.02
Frankfurt/ Oder	BB	4.76	4.85		4.95	4.90	4.86	4.65	4.45	4.07	3.63	2.34	2.03
Hildesheim	NI	4.50	4.53		4.65	4.57	4.55	4.49	4.37	4.01	3.63	2.36	2.03
Kassel	HE	4.52	4.65		4.74	4.49	4.43	4.28	4.22	4.06	3.66	2.45	2.04
Schleswig	SH	4.40	4.33		4.65	4.63	4.63	4.64	4.43	4.18	3.79	2.16	2.05
Schwaben	BY	4.96	5.27	5.83	5.65	5.32	5.00		4.75		4.22	2.49	2.05
Lüneburg	NI	3.97	3.97		4.09	4.13	4.11	4.22	4.15	3.93	3.69	2.30	2.08
Schwarzwaldkreis	BW		5.65	6.01	5.57	5.16	4.90		4.86		4.35	2.40	2.08
Merseburg	ST	5.19	5.24		5.59	5.67	5.57	5.30	5.10	4.62	4.17	2.64	2.09
Donaukreis	BW		5.49	5.97	5.66	5.25	4.81		4.74		4.25	2.49	2.10
Fürstentum Lübeck	SH	4.57	4.54	4.85	4.79	5.03	4.91	4.85	4.79	4.67	4.35	2.46	2.13
Pfalz	RP	4.65	5.09	5.65	5.27	5.05	4.83		4.91		4.29	2.61	2.13
Aachen	RP	4.64	4.80		4.91	4.83	4.84	4.79	4.74	4.50	4.12	2.67	2.14
Birkenfeld	RP	4.54	4.68	5.03	4.84	4.80	4.76	4.67	4.79	4.69	4.38	2.87	2.15
Koblenz	RP	4.49	4.63		4.81	4.63	4.55	4.52	4.48	4.29	3.91	2.65	2.15
Freiburg	BW		4.37		4.33	4.08	3.92		3.96		3.56	2.48	2.16
Konstanz	BW		4.94		4.91	4.50	4.27		4.22		3.86	2.59	2.20
Sigmaringen	BW	4.80	5.11		5.25	4.73	4.38	4.32	4.48	4.42	4.15	2.51	2.20
Stade	NI	4.64	4.71		4.88	4.93	4.85	4.90	4.84	4.71	4.33	2.53	2.20
Oberfranken	BY	4.54	4.71	5.13	4.78	4.65	4.44		4.52		4.04	2.66	2.21
Jagstkreis	BW		5.62	6.05	5.65	5.27	4.90		4.64		4.29	2.70	2.30
Mecklenburg	MV	3.82	4.04	4.34	4.19	4.20	4.22		4.06		3.57	2.64	2.33
Unterfranken	BY	4.57	4.69	5.11	4.68	4.38	4.22		4.34		4.07	2.85	2.35
Münster	NW	3.98	4.09		4.62	4.78	4.91	5.15	5.50	5.71	5.56	3.33	2.44
Trier	RP	4.99	5.03		5.26	5.13	5.15	5.26	5.39	5.26	4.80	3.26	2.45
Oldenburg	NI	4.13	4.09	4.50	4.39	4.35	4.42	4.63	4.74	4.64	4.34	2.91	2.56
Osnabrück	NI	4.28	4.45		4.59	4.63	4.50	4.57	4.60	4.55	4.40	3.05	2.60
Köslin	MV	5.10	5.16		5.25	5.29	5.24	5.21	5.24	4.91	4.55	2.94	2.61
Aurich	NI	4.08	4.19		4.53	4.64	4.71	4.71	4.62	4.52	4.35	3.06	2.72
Oberpfalz	BY	5.15	5.46	6.02	5.87	5.77	5.52		5.59		5.15	3.50	2.91
Niederbayern	BY	5.16	5.46	5.96	5.93	5.82	5.64		5.66		5.29	3.52	2.99

Source: Princeton European Fertility Project. For process of calculations, see Section 3.2

Appendix III: C_V values from respective figures above

	Figure 1: Austria	Figure 2: Germany pre-1940	Figure 3: GDR	Figure 3: FRG	Figure 3: Period β/α NUTS-1 All Germany	Figure 3: C_V Period α NUTS-2	Figure 4: Switzerland
1860							0.16
1867		0.10					
1870							0.14
1871		0.10					
1875		0.12					
1880	0.05	0.10					0.13
1885		0.11					
1888							0.16
1890	0.06	0.11					
1895		0.12					
1900	0.07	0.13					0.18
1905		0.16					
1910	0.14	0.17					0.22
1920							0.28
1925		0.19					
1930							0.30
1931	0.09						
1933		0.18					
1941							0.23
1950							0.23
1960	0.06						0.20
1961	0.15						
1962	0.15				0.11		
1963	0.14				0.10		
1964	0.15				0.11		
1965	0.15				0.11		
1966	0.14				0.09		
1967	0.13				0.09		
1968	0.13				0.09		
1969	0.14				0.10		
1970	0.13		0.06	0.11	0.12		
1971	0.12		0.06	0.13	0.13		
1972	0.13		0.06	0.13	0.11		
1973	0.12		0.04	0.11	0.09		
1974	0.11		0.04	0.10	0.08		
1975	0.12		0.05	0.09	0.09		
1976	0.12		0.06	0.09	0.11		
1977	0.12		0.06	0.08	0.18		
1978	0.11		0.04	0.09	0.20		
1979	0.11		0.05	0.08	0.19		
1980	0.11		0.03	0.08	0.16		
1981	0.09		0.04	0.09	0.19		0.19
1982	0.10		0.03	0.09	0.18		0.20
1983	0.09		0.03	0.09	0.19		0.22
1984	0.08		0.02	0.09	0.18		0.21
1985	0.08		0.04	0.07	0.18		0.20
1986	0.08		0.03	0.08	0.15		0.20
1987	0.08		0.04	0.06	0.14		0.19
1988	0.07				0.06		0.20
1989	0.06				0.07		0.18
1990	0.06				0.06		0.19
1991	0.06				0.16	0.15	0.12
1992	0.08				0.22	0.19	0.12
1993	0.07				0.24	0.21	0.12
1994	0.07				0.23	0.20	0.10
1995	0.08				0.20	0.17	0.10

	Figure 1: Austria	Figure 2: Germany pre-1940	Figure 3: GDR	Figure 3: FRG	Figure 3: Period β/α NUTS-1 All Germany	Figure 3: C _y Period α NUTS-2	Figure 4: Switzerland
1996	0.08				0.17	0.15	0.09
1997	0.07				0.14	0.13	0.11
1998	0.07				0.11	0.11	0.09
1999	0.07				0.09	0.09	0.09
2000	0.06				0.07	0.08	0.09
2001	0.07				0.07	0.07	0.09
2002	0.07				0.06	0.07	0.10
2003	0.05				0.06	0.06	0.09
2004	0.06				0.05	0.05	0.08
2005	0.06				0.04	0.05	0.08
2006	0.06				0.04	0.05	0.09
2007	0.05				0.04	0.04	0.09
2008	0.05				0.04	0.04	0.08
2009	0.06					0.15	

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