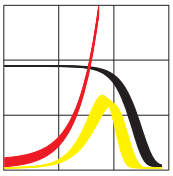


Max-Planck-Institut für demografische Forschung
Max Planck Institute for Demographic Research
Konrad-Zuse-Strasse 1 · D-18057 Rostock · GERMANY
Tel +49 (0) 3 81 20 81 - 0; Fax +49 (0) 3 81 20 81 - 202;
http://www.demogr.mpg.de

MPIDR WORKING PAPER WP 2009-027
OCTOBER 2009

# An Alternative Framework for Studying the Effects of Family Policies on Fertility in the Absence of Individual-Level Data
## A Spatial Analysis with Small-Scale Macro Data on Germany

Sebastian Klüsener (kluesener@demogr.mpg.de)

# An Alternative Framework for Studying the Effects of Family Policies on Fertility in the Absence of Individual-Level Data

## A Spatial Analysis with Small-Scale Macro Data on Germany

Sebastian Klüsener, Max Planck Institute for Demographic Research

## Abstract

For studying both individual-level and small-scale contextual influences on the effects of family policies on fertility, Multilevel Event History methods are the state-of-the-art. But in many countries, these methods cannot be applied because the available individual-level data are inadequate. This paper uses an alternative methodological framework that can be of help in these cases. It utilizes small-scale macro data, which is analyzed with Exploratory Data, Cluster, and Spatial Panel Model Analysis techniques. In a case study on the western German city of Bremen, the potential of this approach, as well as its limitations, are investigated. The study analyzes the impact of the parental leave reform of 1986 and the child benefit reform of 1996 on fertility levels in different city quarters *(Stadtteile)* of Bremen.

The results indicate that both family policy reforms had, at least in the short-term, a significant impact on fertility levels. These positive effects were stronger in economically disadvantaged quarters. The findings also suggest that the reforms affected the timing more than the quantum of fertility. With regard to the methodological framework, we can conclude that the Spatial Analysis with small-scale macro data is a useful alternative when there is no individual-level data available for carrying out a Multilevel Event History Analysis.

### How Can Family Policy Effects on Fertility Be Captured?

In demography, as well as in political science, it is generally agreed that the childbearing behavior of a person is not only influenced by *individual characteristics*, but also by the *social context* in which the person is embedded[1] (see Neyer / Andersson, 2008, p. 710). An ideal approach for capturing family policy effects is a combined analysis of individual-level, as well as of social context data. The most sophisticated method which meets these criteria is a Multilevel Event History approach, as it can adequately account for the influence of individual and context characteristics (Neyer / Andersson, 2008, p. 707 f.; Rindfuss et al., 2007). However, a challenging aspect of this approach is that it requires

[1] Individual characteristics are, for example, the employment status or the educational background; while social context characteristics include, for example, the general economic situation of an area, which may be captured using unemployment statistics or data on average household income levels.

extensive high quality individual-level data and corresponding context information. The individual-level datasets should, ideally, not only include data on all the fertility events of a person, but also on his or her employment and migration histories, social relationships, etc.

Another challenge arises in controlling for the influence of the social context. Because of their size and their sampling design, many individual-level datasets only provide a representative sample for a nation state or a small number of large macro-regions. But to capture the effect of the access to housing or child care, which is usually characterized by strong variations at the local level, datasets would be needed that allow us to model at the district or the communal level (see also Duncan / Jones, 2000, p. 298; Fotheringham et al., 2002, pp. 18 ff.). If macro-regions with high internal heterogeneity are used in a Multilevel analysis, it is very likely that the resulting estimates will be biased[2].

The data requirement aspect is of substantial relevance for research on Germany, where, in contrast to the Scandinavian countries or the Netherlands, no detailed population register data is available for researchers to access. Most of the existing individual-level datasets on Germany offer very limited opportunities to examine contextual effects on a small geographical scale.

In view of these problems, this paper uses an alternative framework that can be of help if there is no adequate data for carrying out a Multilevel Event History Analysis. The study utilizes small-scale macro data, which is analyzed with a set of varying methods. It thereby makes use of the fact that small-scale macro-regions, such as city quarters, often exhibit quite a high level of internal homogeneity: e.g., people with higher or lower income levels, or neighborhoods with high and low housing prices, tend to cluster in certain areas of a town. If, for example, a family policy were designed to support parents financially with income-independent payments, it may be expected to have a greater impact in quarters with low average income levels because the percentage increase in the available income due to these benefits will be highest in low-income households.

The main investigation method is a Spatial Panel Data Analysis, which is accompanied by an Exploratory Data Analysis (EDA) and a Cluster Analysis. This approach has so far been largely neglected in family policy evaluation studies for several

[2] Imagine a big macro-region of several hundred square kilometers with high child care coverage, which exhibits internally high heterogeneity of child care coverage. This is often the case, as towns usually have a better child care infrastructure than peripheral rural areas. However, in a multilevel model, individuals living in a peripheral sub-region with limited child care access would be treated as if they had good access to child care, even though they in fact do not. If the childbearing decisions of these persons are negatively influenced by the limited access to child care, the model would not be able to capture it.

reasons, which will be discussed below. However, there are also good arguments for using this approach when there is a dearth of adequate individual-level data.

A case study is carried out that investigates the effects of the family policy reforms of 1986 and 1996 on fertility levels in the city quarters of the West German city of Bremen. Two main questions are thereby addressed. One asks whether the family policy reforms had an impact on the fertility development in the city quarters of Bremen. Both the effects on the temporal quantum (children per women of fertile age in a given period) and on the timing (average age of the mother at birth) are of interest. A second goal is to investigate what socioeconomic and contextual characteristics of a city quarter influence the impact of the family policy reform on the childbearing behavior in this area. Another aim of this case study is to evaluate both the potential of the proposed alternative analysis framework, and its limitations.

The paper will first present a literature review and will than deal with theoretical and further methodological considerations. This discussion is followed by a description of the policy reforms that are investigated, and an introduction to the case study area. In the second part of the paper, the results of the EDA, Cluster, and Spatial Panel Analyses will be presented.

**Existing Studies on the Effects of Family Policies on Fertility Levels in Germany**

In recent decades, family support measures have become increasingly important in the German welfare state. Currently, the German government is spending more than €60 billion per year on measures directly related to supporting families, if tax exemption regulations are also included (BMF, 2007, p. 63). In view of these numbers, it is surprising that so far only a limited number of quantitative research studies have examined the effects of family policies on fertility in Germany (see Gauthier, 2007, for an overview). One reason might be that, until recently, most of the family policy measures enacted by the (West) German government were at least not explicitly intended to influence fertility levels. This has, however, changed in recent years (see Tremmel, 2005, p. 236). Another reason for this dearth of research might be challenges with regard to data availability.

Most of the existing research results are outcomes of comparative cross-country studies evaluating developments not only in Germany, but in several other industrialized countries as well. The number of papers that focus solely on Germany is even smaller. Gauthier (2007, p. 332 ff.) lists only two: Buttner and Lutz (1990, pp. 551 ff.) used an Age-Period-Cohort Analysis to evaluate the pronatalist policy reform of the GDR in 1976. They conclude that this reform had a significant effect. Hank and Kreyenfeld (2003) investigated the influence of child care accessibility on fertility decisions in Germany (see also Hank et al., 2003). Using a multilevel approach that combines individual-level data with aggregated

district-level context data, they did not find a significant effect for the period of analysis (1984-1999). In general, one can conclude that there are only a small number of studies that evaluate the effects of family policies on fertility in Germany. Therefore, we can assume that quite a substantial research gap exists in this field.

**How Can Family Policies Influence Fertility?**

With regard to the theoretical framework, it is generally assumed that family policies can, in the short- to medium-term, only influence the fertility decisions of those people who are already seriously considering having a(nother) child. In other words, it is very unlikely that policies are able to change the behavior of people who have no intention of having a(nother) child soon. The effect of a policy reform is particularly dependent on whether it weakens inhibiting factors that limit the fertility behavior of people with serious childbearing intentions.

According to McDonald (2001), there are five main general theoretical frameworks that can be used to study current fertility developments: *Demand Theory*; *Theory of Risk and Opportunity*; *Post-Material Value Theory*; *Gender, Family, Market and State Theory;* and *Gender Equity Theory*. The latter three theories are related to values and the general organization of the society. These aspects are usually very difficult to influence in the short run. Therefore, they are only of limited value if the goal is to investigate short- and medium-term effects of family policy reforms in one nation state. However, the *Post-Material Value* and the *Gender Equity Theory* might be of relevance for this case study when policy effects among people with different cultural backgrounds are studied.

In general, however, the *Demand Theory* and the *Theory of Risk and Opportunity* are more useful in evaluating the short- and medium-term effects of family policy measures. These two frameworks are both related to the *New Home Economics* theory (Becker, 1960 & 1991). The basic idea of the *Demand Theory* is that raising children costs money and time. The latter can be transferred in monetary units by opportunity costs, as the parents involved in childrearing could use the time to gain financial capital on the labor market. In the long run, children might also generate financial capital for their parents if they support them financially at older ages. But this potential return is subject to a high degree of uncertainty. This aspect of uncertainty is a main facet of the *Theory of Risk and Opportunity*.

Due to the complexity of potential effects of childbearing on capital accumulation, it would be unrealistic to assume that future parents have a full overview of all the consequences of their childbearing decision. This is also caused by the quite significant uncertainties involved in this process. Nevertheless, it is believed that most childbearing behavior is rational, and can therefore be influenced by family policies.

As for the mechanism, it is assumed that family policies can influence the impact of having a child on capital accumulation. In this context, capital refers not only to financial means, but also to human capital, such as skills and knowledge, as well as to social capital, such as social networks and connections, both in the public and the private spheres. Parental leave support benefits, which were extended in the West German family policy reform of 1986, can, for example, limit the opportunity costs which occur if one or both parents are not able to participate fully in the labor market due to childrearing obligations. Child benefits, which were the focus of the 1996 reform, can directly decrease the costs of raising children.

**Spatial Analysis with Small-Scale Macro Data**

As was noted above, Multilevel Event History models are best suited to evaluating the effects of family policies on fertility levels if adequate individual-level data is available. It was also mentioned that the analysis of small-scale macro data has so far not been used in family policy evaluation studies. One important reason for this is that it is practically impossible in macro data analyses to control for individual characteristics of the studied population. Imagine two areal units that differ with respect to the educational attainment of the fertile female population. If fertility levels in these areas react differently after a family policy change, it is not possible to determine with macro data whether this is caused by the fact that females with lower/higher educational attainment reacted differently after the reform. This could only be detected with individual-level data. This problem is also known as the ecological inference fallacy (Robinson, 1950).

But the challenge of ecological inference is less problematic in investigations with small-scale macro data than it is in investigations with large-scale macro data. The reason is that city quarters or municipalities are, compared to nation states and macro-regions, generally much more homogenous with regard to certain socioeconomic characteristics of their inhabitants and the accessibility of infrastructure (see also Carstairs, 1981, p. 131). In addition to this lower degree within-unit variability, there is also a much higher between-unit variance at the city quarter or municipal level than at the macro-region level.

Another problematic aspect of spatial macro data is that it is not possible to control adequately for the social context or the network of social relations in which a person is embedded. But also most of the existing individual datasets on Germany do not include adequate information on the social context of each person.

One more challenge involved in conducting studies with macro data is that it is very difficult to capture phenomena such as postponement, which leads to increases in the ages of mothers when they give birth to their first, second, and subsequent children (Sobotka, 2004; Kohler / Ortega, 2002). This can be a problem if no or only inadequate data

on births by age group and parity are available, which is the case for Germany. Official German birth statistics only provide information on the number of children born to a mother within a marriage, but not on the overall number of children born to that woman. Given that, in recent decades, the number of children born to unmarried women has increased substantially (see Konietzka / Kreyenfeld, 2002, p. 332 and Fig. 9), it has become more and more problematic to capture changes in the average age at birth using these "parity" statistics.

Another possible reason why the use of small macro datasets is not widespread could be that, in many countries, statistical offices have no strict regulations on what geographical location should be considered the place of birth (e.g., the actual place of birth or the residence of the mother). But these problems do not exist in Germany, where the mother's residence is always registered (Richter, 2006, p. 11).

In contrast to micro datasets, a positive aspect of small-scale macro datasets is that they are usually available for much longer periods of time. In Germany, for example, small-scale macro data is available for some regions as far back as the late 18$^{th}$ or early 19$^{th}$ centuries. With regard to the spatial dimension, this data is usually available down to the municipal level. For bigger cities, data even exists at the city district or city quarter level. Data availability problems might only arise due to area reforms. Individual-level datasets, on the other hand, are only available for recent decades. The SOEP, for example, did not start in West Germany until 1984, and in East Germany until 1991. Meanwhile, the Micro Census was first carried out in 1957 in West Germany and in 1991 in East Germany.

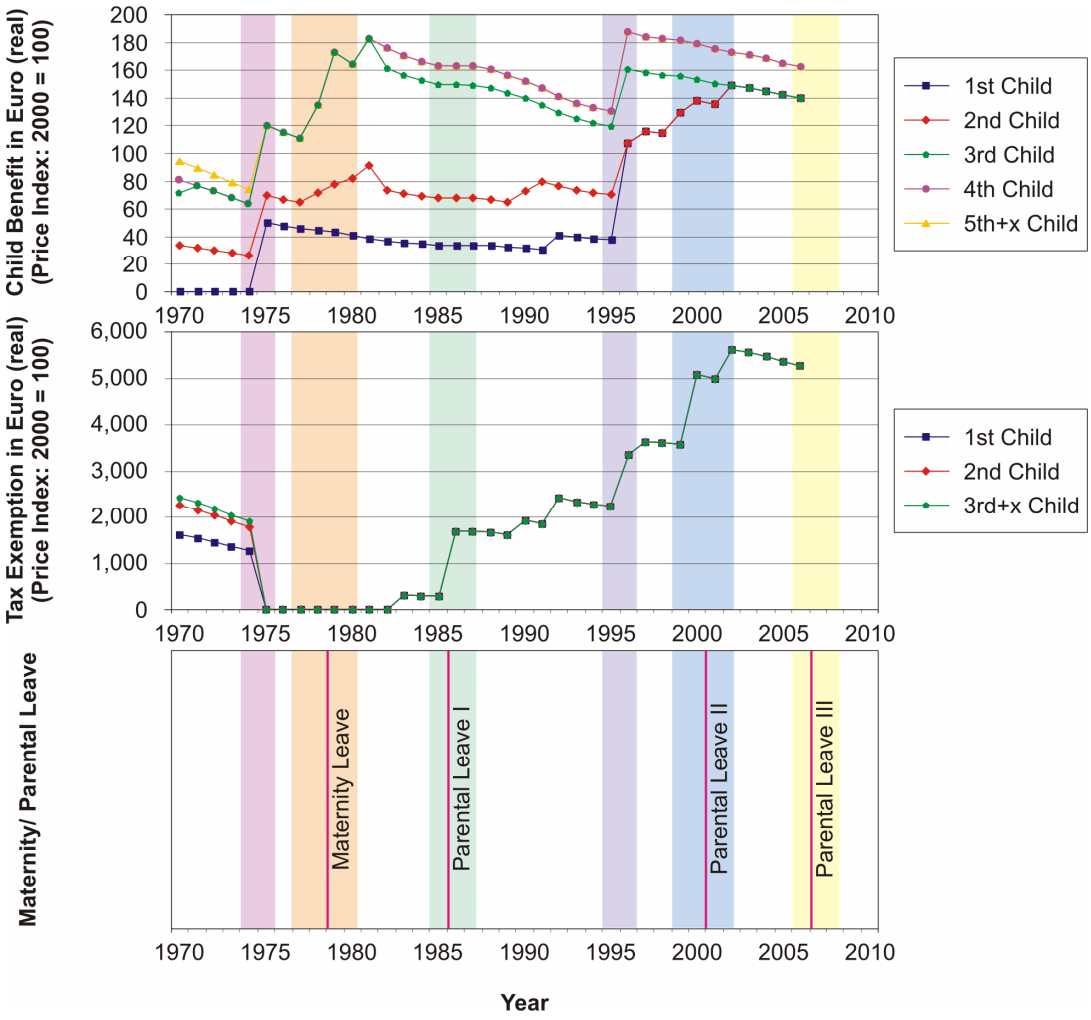
After taking all these considerations into account, we can conclude that the analysis of small-scale macro datasets might be a valuable approach for evaluating family policies. This is especially true if no adequate individual-level data are available. The case study will explore both the potential and the limitations of this approach.

In addition to questions concerning data availability and the choice of method, an important methodological issue that must be addressed is how best to isolate family policy effects from other factors that influence fertility development. Family policy measures are very complex, and interact with other political and socioeconomic factors. This can make the analysis of policy effects on fertility challenging (see Neyer / Andersson, 2008, p. 708). Therefore, Neyer and Andersson (2008, p. 708) suggest focusing the analysis on time periods with significant policy changes. These are most likely critical junctures (see also Thelen, 1999; Pierson, 2004) with respect to the childbearing behavior of a population. Thus, reform periods are probably most suitable for assessing the effect of a specific policy measure in a particular spatio-temporal setting. This study therefore focuses on the family policy reforms of 1986 and 1996.

**Family Policy Reforms of 1986 and 1996**

In recent decades, a wide variety of policies have been implemented in Germany that are designed to improve the general living conditions of families and single parents with children. Figure 1 gives an overview of the development of the most important national family support measures since 1970 in (West) Germany. This paper focuses on the parental leave reform of 1986 and the child benefit reform of 1996. Data on the reforms of the 1970s have been excluded from the analysis because many important covariates are missing for this period. The most recent parental leave reform, which took place in 2007, has not been analyzed, as it is too early to draw conclusions about the effects of this reform. Of the remaining initiatives, the reforms of 1986 and 1996 were the ones with the most far-reaching implications, and were therefore most likely to have affected fertility levels.

**Fig. 1: Development of Family Support Measures (Critical Junctures)**




Sources: BMF (2007), pp. 59 ff.; Hauß (2003), p. 311; SB (2007), p. 3

In the policy reform of 1986, the maternity leave (*Mutterschaftsurlaub*), which had been introduced in 1979 as an addition to the existing maternity protection period (*Mutterschutz*), was extended from four to 10 months. A second aspect of this reform was

that fathers and economically inactive people also became eligible to take parental leave and receive parental benefits from the state. To account for the changes in the types of people who were now eligible to take advantage of the leave, the term "maternity leave" was replaced with the gender-neutral term "parental leave" (*Erziehungsurlaub*). At the same time, the monthly financial support scheme was changed. The monthly payment—which had been income-dependent, with a lower threshold of 105 DM and an upper limit of 510 DM—was turned in a lump sum, and raised to 600 DM per month. From the seventh month onwards, this support was means tested depending on the income level of the household (Kolbe, 2002, p. 332). In addition to the reform of the parental leave, the tax exemption was also raised substantially, from 432 DM to 2,484 DM per year and child. The family policy reform of 1996, on the other hand, led to a drastic increase in child benefits, as is demonstrated in Figure 1. The tax exemption was also increased in that reform.

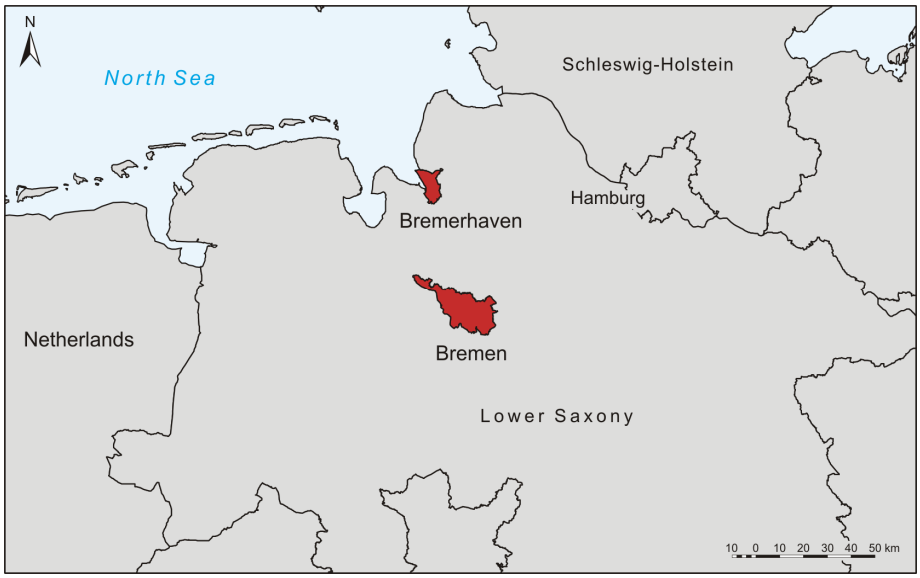
**The City of Bremen – A West German Town in Socioeconomic Transition**

The selection of the case study city was based on three main criteria. The first was that small-scale macro data should be available for a long time period. One prerequisite of this condition was that no substantial local reforms had been carried out in recent decades. The second criterion was that the case study city should exhibit heterogeneity over space with respect to the development of local fertility rates or important socioeconomic covariates. The third criterion was that the town should have had below-average levels of economic development in recent decades. The motivation behind selecting this criterion is that the two family policy reforms studied were intended to increase financial support for families, and the support was largely income-independent. Therefore, it is likely that people with low incomes benefited the most from these reforms, and that the effects of the reforms on fertility were probably more pronounced in economically disadvantaged areas of Germany. Given these three criteria, the city of Bremen was identified as best suited for the study.

The city of Bremen is situated in northwestern Germany (see Fig. 2). It has a population of 547,627 inhabitants (01.01.2008). Over the last 35 years, the socioeconomic development of Bremen has been dominated by three processes: a structural economic crisis, an expansion of higher education institutions, and a gentrification process in the quarters close to the city center. The data analysis will demonstrate that all three processes affected the development of fertility.

The unfavorable economic development since the late 1970s was mainly caused by the decline of the shipbuilding industry that led to mass dismissals. Another structural problem of the city economy was that the service sector, except for the trade sector, was relatively underdeveloped (Wauschkuhn, 1998, pp. 6 ff.). This constituted a challenge in the transition from the fordistic industrial era towards the postfordistic era (see Amin, 1994).

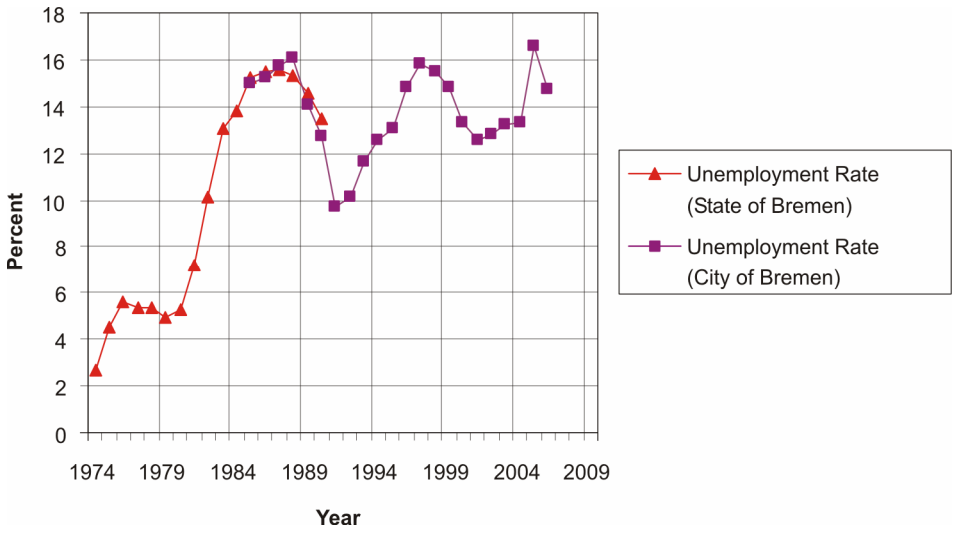
**Fig. 2: City State of Bremen in Northwest Germany**




Base Map: BKG(2007)

The structural economic crisis started in the beginning of the 1980s, and has still not been completely overcome (see Fig. 3). In 2008, the unemployment rate among the dependent employed in the State of Bremen was 12.6%, which was more than 50% higher than the West German average of 7.2% (BfA, 2009a, p. 53).

**Fig. 3: Development of the Unemployment Rate (1974–2006)**



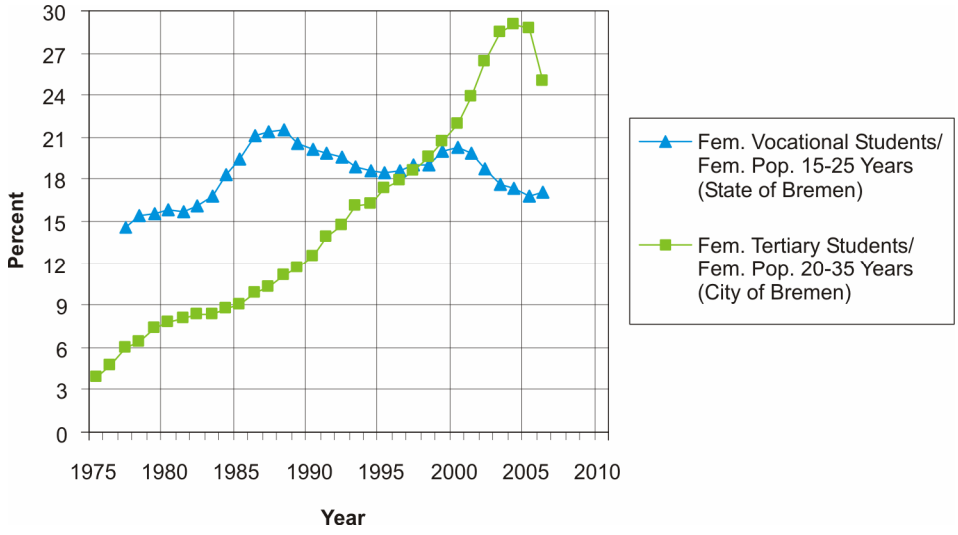

Source: SLB (2008a)

Politicians reacted to the crisis by initiating economic and structural changes. Their goal was to lessen the dependence of the city economy on heavy industry by supporting the development of the service sector and knowledge-intensive industrial sectors (e.g., aviation and space industry). Another coping strategy was the expansion of higher education institutions. This had, among other aims, the goal of supporting the economic restructuring by increasing the human capital of the population. From 1970 to 2007, the number of

students at higher education institutions in the city of Bremen increased from 3,380 to 28,588 (SLB; 2006, p. 10).

To capture the expansion process, two indices have been constructed (see Fig. 4). The first index shows the percentage of women in vocational training in relation to the age group 15-25[3]. The second index is calculated by putting the number of female tertiary students in relation to the age group 20-35. Figure 4 shows that there have not been many changes in the vocational training index over the last 30 years. But the higher education index increased steadily nearly tenfold. Only in the very last year of the period studied was this general upward trend reversed for the first time.

**Fig. 4 Indices Female Students/ Female Population**




Sources: SLB (2008b); SLB (2007), p. 21; SLB (2006), p. 10

The third important trend, which is partly related to the expansion process of tertiary education institutions, is the gentrification process (see, for example, Zukin, 1987). In this process, rundown neighborhoods that are conveniently located close to the city center receive an influx of middle-class or affluent people. This leads to a process of renewal and rebuilding, which forces most of the lower-class population to leave these areas due to rising housing costs.

Both the academic expansion and the gentrification process contributed to the increase in the spatial social segregation within the city of Bremen. As a result, today it is possible to make a clear distinction between quarters with a high share of university graduates, high incomes, and low levels of fertility; and quarters with low incomes and high fertility levels.

[3] Unfortunately, the data on vocational students is only obtainable for the whole state of Bremen, which also includes the city of Bremerhaven.

**Analysis of Family Policy Effects with EDA and Spatial Panel Modeling Methods**

The city of Bremen consists of five city districts (*Stadtbezirke*) that are further subdivided in 23 city quarters (*Stadtteile*) and 81 local areas (*Ortsteile*). The local areas usually have only a very small number of females of reproductive age, which would cause substantial noise in the analysis. Therefore, this study focuses on the level of the city quarters. However, six bigger quarters were subdivided into two parts, while two neighboring smaller city quarters were combined. In this procedure, the following rules were followed: each spatial unit should have at least 1,500 females of reproductive age over the period studied, combined local areas/city quarters should share a border and should exhibit similarities with regard to important covariates, and quarters with high internal heterogeneity should be divided. The procedure resulted in 28 spatial units that were used for the analysis.

In the first part of the analysis, an emphasis is placed on Exploratory Data Analysis methods. They are used to derive additional working hypotheses from the data. At this stage, a Cluster Analysis is also carried out in order to identify units, which are similar with respect to important covariates. This exploratory stage is followed by a modeling phase, which tests the hypothesis derived from the literature and the Exploratory Data Analysis. In this phase, Spatial Panel Modeling techniques are used.

In the following, the dependent variable and the covariates will be discussed. The covariates are divided in three subcategories: socioeconomic, cultural, and infrastructure.

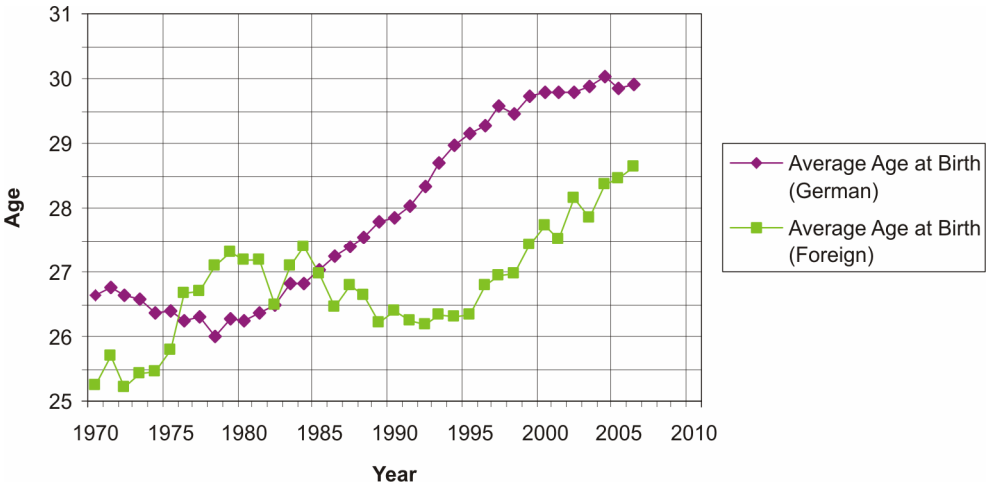
**Total Fertility Rate as Dependent Variable**

In this study, the Total Fertility Rate (TFR) is used to measure fertility. This is in line with most studies focusing on fertility differences on a small geographic scale (de Beer / Deerenberg, 2007, p. 512). A problematic aspect of the TFR as a period measure is, however, that it is influenced by changes in the age at childbearing (see, for example, Sobotka, 2004). These changes were considerable in Bremen over the last 25 years, as the mean age at birth rose substantially (see Fig. 5).

To correct for changes in the average age at birth, tempo-adjusted fertility measures have been proposed (e.g., Kohler / Ortega, 2002). But these measures are only of use if the observed spatial units are not affected by age-selective in- and outmigration flows of women of reproductive age. This is usually not a major problem in studies at the national or macro-regional level. But on a smaller scale, these selective migration flows can have a big impact, as will be shown in the case study. Another challenge is that these tempo-adjusted measures also require extensive data, such as information on parities, which are not available for Germany at the local level. Therefore, tempo-adjusted measures are not applicable for this study (see also de Beer / Deerenberg, 2007, p. 513). In addition to the

TFR, the age-specific fertility rates are assessed. This is done to give us an impression of whether the family policies affected the timing of births.

**Fig. 5: Average Age at Birth – City of Bremen**




Source: SLB (2008a)

**Socioeconomic, Cultural, and Infrastructure Covariates**

The socioeconomic covariates are designed to capture the social and economic situation of the population and its development over time. Another aim of the social covariates is to capture the general attitudes among the fertile population towards having a(nother) child in the near future.

With regard to the intention to have a(nother) child soon, Event History research with individual data has revealed that **being in education** has a delaying influence on the transition to motherhood (e.g., Blossfeld / Huinink, 1991; Kreyenfeld / Mika, 2008). Blossfeld and Huinink (1991, p. 164) also showed that more highly educated females have, after completing their education, a higher-than-average risk of having a first child. This effect, which Lappegård and Rønsen (2005) also found in Norway, is sometimes referred to as the "catching-up" effect. These findings are very important for studies at the local level due to selective migration processes (see also Michielin, 2002, p. 28 pp.).

Cities with higher education institutions receive a substantial in-migration of young women who are attending those institutions. These female students usually reside in city quarters close to these institutions, or areas where student dormitories are located. Because of the delaying effect of being in education on transition to motherhood, it is assumed that, among students, the share of women who intend to have a child soon is lower than among non-students. Therefore, family policy reforms that are intended to improve support for families should have a smaller positive effect on fertility in city quarters with a high number of students. This should be especially the case for increases in tax exemptions. Or, if there is an effect, it should be among the 30-45-year-old females, rather than among the 15-30-year-olds.

It would be desirable to have information on the share of women in education. Unfortunately these statistics are not available. There is only data from the 1987 census about the number of females with an educational qualification known as the *Abitur* for certain age groups (18-25; 25-30; 30-50 years). The *Abitur*, a secondary school degree that qualifies students to enter university, is commonly obtained at around age 19. We decided not to use the data of the youngest age group (18-25 years), because in this age group the share of women with an *Abitur* qualification might be influenced by the age structure of the base population, in case the 18-year-old female age group is over- or underrepresented. Instead, we decided to use the **share of females with an *Abitur* degree in the age group 25-30** for investigating the effect of the policy reform of 1986.

But this is, unfortunately only a crude proxy for being in education, as not all women with an *Abitur* degree are still in education at ages 25-30. Another problem is that there is no information about the development of this indicator over time, which must have been substantial, when we take the expansion of higher education institutions into account.

With regard to general attitudes towards having children, it is also important to note that, in the West German context, marriage is still an important prerequisite of transition to motherhood (Konietzka / Kreyenfeld, 2002, pp. 341, see also Fig. 9). Therefore, data on marriage rates or the share of married females provides information on general attitudes towards parenthood. Marriage rates are only available from the year 2000 onwards. But data on the **share of married women among 18-50-years-olds** is available from 1971 onwards, so we decided to include this data in the models. We expect to find that policy reforms have a greater effect on fertility in quarters with a higher share of married females. This variable also has a connection to being in education, as most females in West Germany prefer to postpone marriage and transition to motherhood until they finish their education (Bernardi et al., 2008, p. 304). Thus, a lower share of married females might be partly caused by a higher share of people in education.

To illustrate the development of the economic situation over time, data on **unemployment rates** is included in the models. The effect of unemployment on fertility is disputed, and might vary between different regions and/or over time. Kravdal (2002, pp. 288) found in a register census-based study in Norway that unemployment has a negative impact on fertility, both on the aggregate and the individual levels. Thus, the aggregate-level effects of unemployment on fertility are stronger than individual-level effects. However, Kreyenfeld and Mika (2008, p. 20) found for West Germany that individual-level unemployment has usually a positive effect on the transition to motherhood. The variations in the effects of unemployment between countries might be caused by differences in the family and labor policies of these states. Due to these mixed findings, no assumption is made in the modeling as to whether unemployment has a positive or negative effect.

Data on the unemployment rates at the city district level is only accessible from 1999 onwards. But numbers for the city of Bremen are available as far back as 1985, and for the state of Bremen starting in 1974. The fact that, for most of the period studied, no data for the city quarters exists is not considered a major drawback, as people could easily commute to other quarters if those areas offered better work opportunities. Therefore, it is assumed that it is the general unemployment rate at the city level that has an impact on fertility.

The unemployment rates for the state and the city of Bremen are taken from the official unemployment records. The unemployment rates for the city quarters are calculated by dividing the number of unemployed persons by the sum of the people in socially dependent employment, and the number of unemployed. Unfortunately, no information on self-employed people could be obtained.

With regard to the **labor force participation rate of women,** only data from 1999 onwards is available. Therefore, this data can only be included in the model of the policy reform of 1996. The effect of the labor market participation of women on fertility has been widely discussed in recent years. Cross-country studies investigating the development of the correlation between the TFR and female labor market participation rate (FLP) in OECD countries have found a reversal in this relationship over the last four decades (see, for example, Rindfuss et al., 2003, p. 425). Until the beginning of the 1980s, the association had been negative, but it changed to a positive value thereafter.

Engelhardt et al. (2004) and Kögel (2004) have, however, shown that neither the causality nor the time series association has changed over time. Kögel (2004, pp. 6) suggests that the changes in the correlation might be caused by two factors: unmeasured country specific factors, and country heterogeneity with regard to the magnitude of the negative time-series association between TFR and FLP. For Germany, Birg et al. (2007) studied the association between the FLP and the General Fertility Rate using data for the 439 districts. They did not find indications for a significant relationship (Birg et al., 2007, p. 43). In our study, the variable is included. But, due to the mixed findings, no assumptions on the effect are made. The FLP is calculated by putting the number of women in dependent socially insured employment in relation to the number of females aged 15 to 65.

For the year 2001, information on the declared **income of non-juridical persons** is also available. As it is assumed that income levels in the city are rather stable, we decided to include the 2001 data in the model of the 1996 reform to control for income effects on fertility. We expect that income has a positive effect on fertility. However, based on the findings of Borg (1989, p. 309), it is likely that the model does not capture this correctly, as it is not possible to control adequately for the net costs of raising a child. With regard to policy effects, it is believed that reforms designed to support parents financially are more

likely to have an effect in quarters with low income levels. The underlying reason for this assumption is that, in those quarters, a higher share of people can be expected to be limited in their childbearing behavior by financial constraints. The indicator is calculated by dividing the total income sum of a city quarter through the population over age 15. We decided not to use the total population as base population, as it is assumed that the incomes of inhabitants aged zero to 15 are generally low. Based on the distribution, we decided to introduce the logarithm of the variable as covariate in the model.

With regard to cultural covariates, only the **share of foreign women** among the females aged 15 to 45 years is included in the model. This is done in order to determine whether quarters with a high share of foreigners experience a different fertility development after a policy reform than the other quarters. The use of the share of foreign women as a control variable for cultural influences is very problematic (see Frejka et al., 2007, pp. 35 ff. for an overview over the discussion). One reason is that foreign women are a very heterogeneous group, comprising people from countries with high, medium, and low fertility rates. Another problematic aspect is that foreigners often differ from the non-foreign population, not just culturally, but also socioeconomically. Foreigners are on average less well-off than Germans. The composition of this group can also differ greatly between the cross-sectional units.

The use of the TFR as a dependent variable in this study presents further difficulties. Several authors have argued that the TFR is very problematic with regard to measuring the fertility of immigrants (see Frejka et al., 2007, pp. 35 ff.). Schoorl (1995, p. 103) points out that the TFR of migrants reflects "various aspects of the migration process: selective migration and migration policies, disruption of the process of family formation due to migration, the degree to which migration is marriage migration, and -in time- adaption or assimilation."

Most studies have found that migrants adapt their fertility behavior to that of native women within 10 years after arrival (Schoorl, 1995). However, women from Muslim countries in particular show a slower pace towards convergence with local fertility patterns (Andersson, 2004). This is relevant in the case of Bremen, where Turkish people still form the biggest group of foreigners, although the share of Turkish women among all foreign women has decreased in recent decades, from 55.4% in 1980 to 32.5% by 2006 (SLB, 2008a).

Due to a lack of alternatives, and because the fertility of migrants is not the prime concern of this study, we have chosen to use the share of foreign females as a covariate. In line with the findings of Frejka et al. (2007, p. 42), and considering the high share of Turkish women, we assume that the share of foreign women has a positive effect on fertility.

Regarding infrastructure indicators, it is believed that migration patterns of women of reproductive ages reveal information about the general attractiveness of a quarter for families with children. But migration is problematic, as it can influence fertility in both directions. Migration to an area with the intention of pursuing an education can, due to the delaying effect, be expected to have a negative effect both on the TFR, and on a potential positive reaction after a policy reform. But another important reason for migration to an area is the intention to have a child. This kind of migration probably has a positive effect on the fertility of an area (see also Kulu, 2005). Official statistics do not provide any information on the reasons for migration. But it is to some extent possible to exclude education-related in-migration by only focusing on the migration behavior of people above age 25. Thus, the **net migration of women between ages 25 and 50** is used for the model. We believe that this covariate has a positive effect on the TFR.

With regard to costs of housing, data on the **average rent per square meter** is available for the city quarters of Bremen, but only for the years 1968 and 1987. Therefore, it can only be included in the model of the 1986 policy reform. Housing prices are believed to have a negative impact on fertility, as high prices might limit childbearing intentions due to limited access to adequate housing.

In addition to the above described indicators, it would have been desirable to have information on local child care availability. But unfortunately this data is not obtainable for the city quarter level. To include the data for the city of Bremen is regarded as non-informative, as there might be substantial differences in the availability of child care in the different quarters.

For the **family policy intervention,** a binary variable is included in the model, which is zero for the years before the reform, and one for the years thereafter. If the legislative reform came into force on the 1st of January of a year, this year is treated as a period after the reform. This choice was also motivated by the fact that the studied interventions were known several months in advance. If the reform is enacted within a year, only the following year is treated as time after the reform.

**Cluster Analysis and Descriptive Findings**

In order to identify regions that had similar social and economic characteristics during one of the two studied reforms, a Cluster Analysis is carried out for each of the two periods. The variables, which are included in the analyses, correspond to those of the Spatial Panel Analysis (see Tab. 1 and Tab. 2). As the variables have different scales, they are standardized by a z-transformation; the k-means-cluster algorithm is used to identify the clusters. We decided to generate two clusters so that the clusters are still big enough to run a Spatial Panel Analysis on a single cluster.

The summary statistics for the two identified clusters of city quarters at the time of the family policy reform 1986 are shown in Tab. 1. The values are mean values of the city quarters. Big differences between the two clusters exist in the percentage of females between 25 and 30 years old who have an *Abitur* degree. This is probably due to the fact that the Cluster-1 quarters are mainly situated around the city center and the university campus, where a lot of students are likely to live (see Fig. 6). Another substantial difference between the quarters can be seen in the migration balance, which in 1985 was only slightly negative in Cluster 1, and highly negative in Cluster 2. The share of foreigners is approximately 50% higher in Cluster 2 than in Cluster 1.

**Tab. 1: Policy Reform 1986 (Bremen) – Cluster Analysis**

| Variable | Cluster 1 | Cluster 2 |
|---|---|---|
| Percentage with *Abitur* 1987 (Females 25–30 y.) | 40.29 | 9.05 |
| Percentage Married 1985 (Females 18–50 y.) | 48.08 | 59.32 |
| Percentage Foreigners 1985 (Females 15–45 y.) | 5.93 | 9.06 |
| Migration Balance 1985 (Females 25–50 y.) | –0.80 | –6.09 |
| Rent per m² 1987 | 8.09 | 7.44 |

Source: SLB (2008a), own calculations

For the reform of 1996, we must investigate whether the differences between the clusters persisted. It is possible that some city quarters changed their characteristics, making it advisable to move them from one cluster to the other. Thus we decided to conduct another Cluster Analysis, this time using data for the mid-1990s. The variables used for this period differ to some extent, and are shown in Table 2.

**Tab. 2: Policy Reform 1996 (Bremen) – Cluster Analysis**

| Variable | Cluster 1 | Cluster 2 |
|---|---|---|
| Percentage Married 1995 (Females 18–50 y.) | 48.24 | 54.20 |
| Unemployment Rate 1999 | 14.83 | 20.22 |
| Female Labor Force Participation Rate 1999 | 40.00 | 36.45 |
| Declared Income per Capita 2001 (Population > 15 y.) | 15,589 € | 9,222 € |
| Percentage Foreigners 1995 (Females 15–45 y.) | 11.52 | 19.12 |
| Migration Balance 1995 (Females 25–50 y.) | 7.13 | –5.62 |

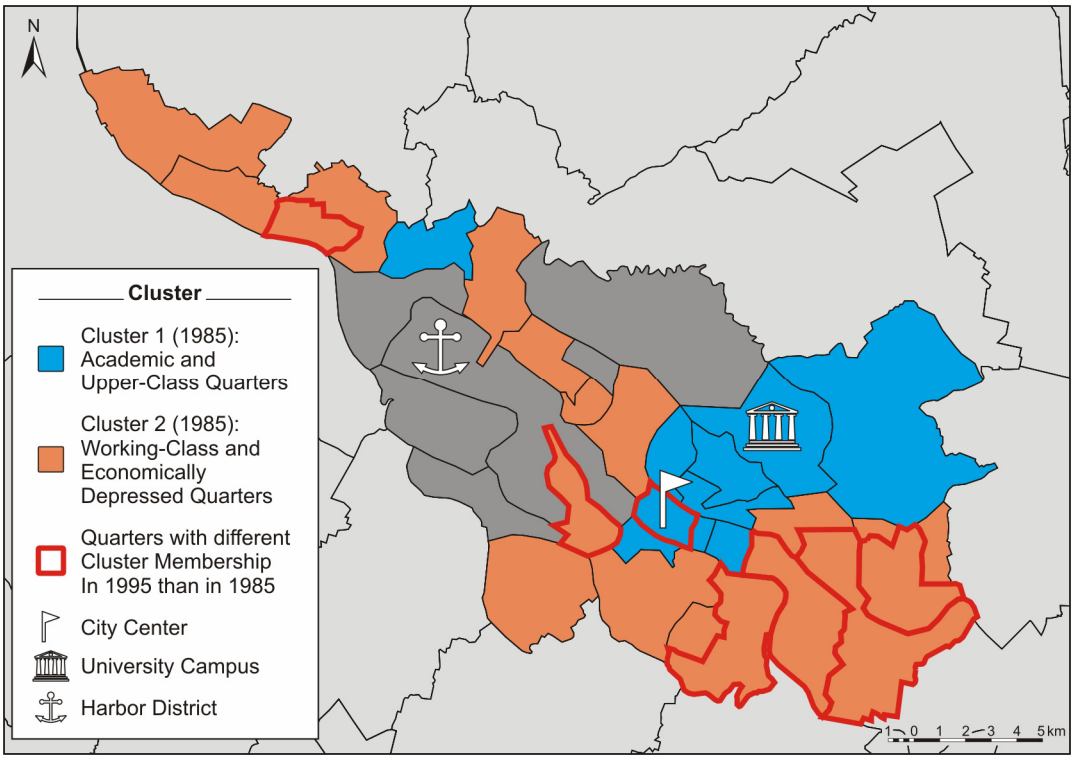
Source: SLB (2008a), own calculations

Contrasting the results of the two Cluster Analyses, we see that 21 units end up in the same cluster, while seven units changed their cluster membership. Therefore, it is not advisable to use the same clusters for the two different time periods. Table 2 displays summary statistics for the cluster derived from the Cluster Analysis using the data from the mid-1990s. They show that the newly created clusters have differences similar to the ones derived from the data from the mid-1980s. The percentage of foreign females is nearly

twice as high in Cluster 2 as in Cluster 1. Differences in the migration balance increased, turning positive in Cluster 1, while staying negative in Cluster 2. Discrepancies in the percentage married diminished, but continue to exist.

In addition to these three indicators for the period of the 1996 reform, data on the unemployment rate, the female employment rate, and the average income per city quarter are accessible. The first two indicators are available from 1999 onwards, while data on income is only obtainable for the year 2001. The income numbers are especially remarkable. In the Cluster-1 quarters, the average income is more than 50% higher than in the Cluster-2 quarters. The gap between the unemployment rates is also quite substantial. The differences in the female employment rate are, on the other hand, pretty small.

**Fig. 6: City of Bremen – Map of the Clustered Quarters (1985/ 1995)**

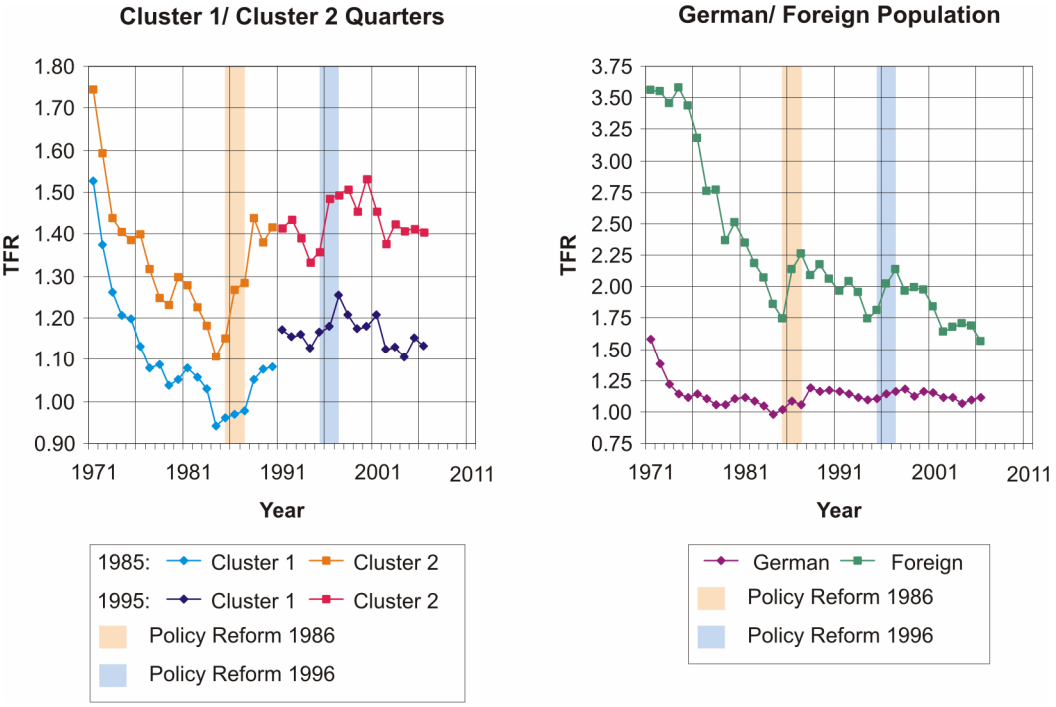



Source: SLB (2008a), own calculations

Despite the fact that seven quarters change their cluster membership between 1986 and 1995, we can in general conclude that, in both periods, Cluster 1 is made up of the quarters with a high share of university graduates and people with high incomes. Among those quarters are the gentrified areas around the city center (see Fig. 6). The traditional quarters of the wealthy population (e.g., Horn, Schwachhausen, St. Magnus) and the city quarters around the university also belong to this cluster. In 1995, most of the quarters in the southwest of Bremen joined this cluster. The second cluster includes quarters around the harbor, which are dominated by post-war architecture and a working-class population. In addition, all the tower block quarters constructed in the 1960s and 1970s, which are today mainly populated by economically disadvantaged people, belong to this cluster.

Figure 7a shows the development of the mean TFR in the Cluster-1 and Cluster-2 quarters for the period 1971 to 2006. For the period until 1990, the data represents the clusters of city quarters derived from the Cluster Analysis using data for the mid-1980s. From 1991 onwards, the clusters are based on the results of the Cluster Analysis using data from the mid-1990s. The family policy reform periods of 1986 and 1996 are highlighted. Figure 7b displays the changes in the TFR of German and foreign women. The latter are not mean values of the districts, but are based on the whole population of each cluster.

**Fig. 7: TFR Development in Bremen (1971–2006)**[4]




Source: SLB (2008a), SLB (2008c)

In the time around 1986, we can see quite a substantial upward trend in Cluster 2, but only a small increase in Cluster 1. In 1996, a considerable increase in the Cluster-2 quarters is also visible. But this only lasted until 2001, when it fell back to the level of the mid-1990s. In the Cluster-1 quarters, the rise of the TFR was even less long-lasting. Figure 7b shows that the TFR of foreigners increased more in the periods after the two reforms than the TFR of Germans. In the following multivariate analysis, we will investigate whether the observed fertility developments can be statistically associated with the family policy reforms.

[4] Please note that the clusters were identified based on data for the mid-1980s and mid-1990s. Taking into account that the academic expansion and the gentrification process did not start until the 1960s, it is likely that these clusters had a different composition in the 1970s. Therefore, the displayed numbers for the 1970s should be treated with great caution.

**Analyzing Family Policy Effects with Spatial Panel Models**

To assess the effects of the family policy reforms of 1986 and 1996 on fertility development, a multivariate Spatial Panel Analysis (see, for example, Baltagi, 2001, for an overview) is carried out. Depending on the results of the Hausman test (Hausman, 1978), either a Fixed or a Random Effects Model is used. In addition to the Fixed and Random Effects Models, a Between Model is also calculated to investigate structural differences between the cross-sectional units (see also Baltagi, 2001).

A challenge in spatial modeling on a small geographical scale is that the assumption that the observations of the different units are independent from each other usually does not hold. In many cases, units with the same characteristics (e.g., high or low TFR) are clustered in space. This is not a problem as long as the explanatory variables exhibit a similar spatial pattern as the dependent variable. But if this is not the case, then some diagnostics, such as the R-squared, are wrongly estimated due to an over- or underestimation of the variance in the data. To check whether the model is influenced by spatial autocorrelation, the residuals are analyzed with a global Moran's I test (Cliff / Ord, 1981). In carrying out this test, a first order queen contiguity spatial weight matrix is used. This defines as neighbors all city quarters that share common boundaries or vertices.

**Tab. 3: Covariates included in the Models**

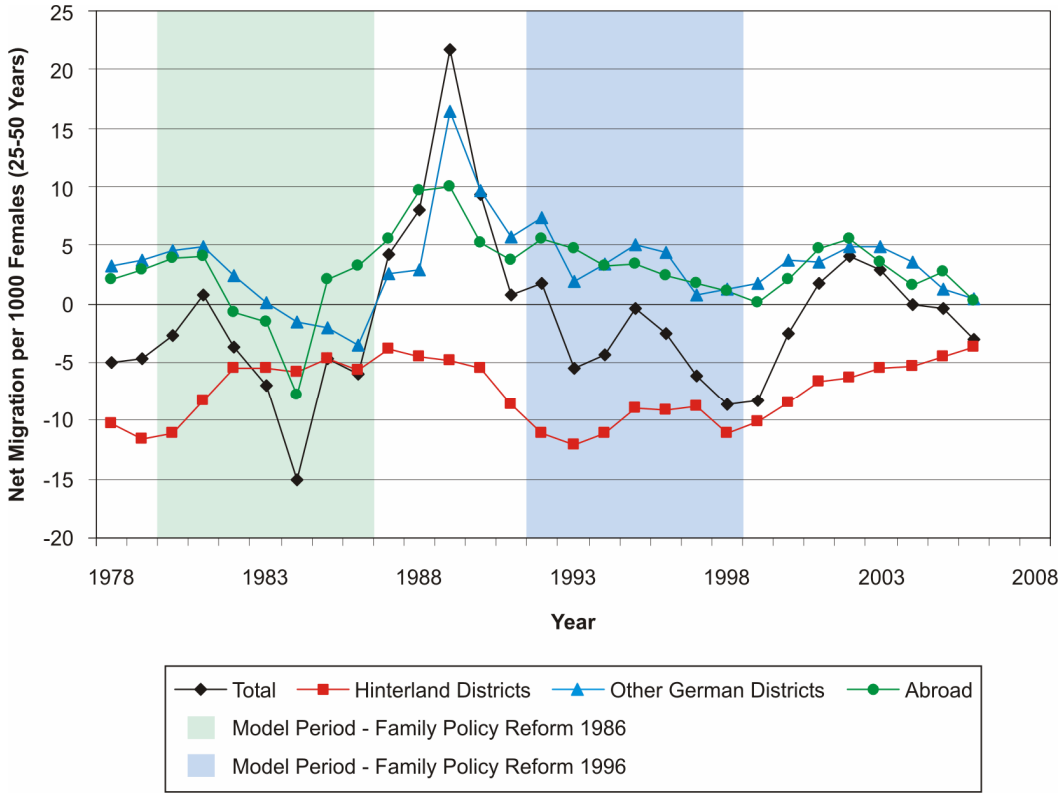
| **Policy Reform** | **1986** | **1996** |
|---|---|---|
| Years included in the model | 1981–1987 | 1993–1999 |
| Percentage with *Abitur* (Females 25–30 years) | CS (Census 1987) | – |
| Percentage Married (Females 18–50 years) | CS, $T_{-1}$ | CS, $T_{-1}$ |
| Unemployment Rate | $T_{-1}$ (State of Bremen) | $T_{-1}$ (City of Bremen) |
| Female Labor Force Participation Rate | – | CS (1999) |
| Declared Income per Capita (Population > 15 years) (log) | – | CS (2001) |
| Percentage Foreign (Females 15–45 years) | CS, T | CS, T |
| Migration Balance (Females 18–50 years) | CS, $T_{-1}$ | CS, $T_{-1}$ |
| Average Rent per m² | CS (Census 1987) | – |
| Policy Reform | 1981–1985:0<br>1986–1987:1 | 1993–1995:0<br>1996–1999:1 |
| CS: Cross-Section; T: Time | | |

Source: SLB (2008a)

Table 3 displays which time periods and covariates were used to model the different policy reforms. For the policy reform of 1986, the choice of the time period 1981 and 1987 was motivated by the following considerations. Data would have been available from 1980 onwards, but we did not want to come too close to the family policy reform of 1979, as we might otherwise capture potential short-term effects of this reform in the model. The end year 1987 was chosen to avoid including the years around the fall of the Iron Curtain in the model. This event caused a massive inflow of German and foreign

migrants from East Germany and Eastern Europe (e.g., *Aussiedler*) between 1987 and 1991 (see Fig. 8). It is not unlikely that this change in the migration trends played a major role in the substantial increase of the TFR after 1987 (see Fig. 7).

**Fig. 8: Migration – Women (25–50 y.) (City of Bremen) (1978–2006)**




Source: SLB (2008a)

Table 4 shows the estimates and diagnostics for the Between, Fixed Effects and Random Effects Models for the policy reform of 1986. With regard to the choice of the Fixed or the Random Effects Model, the Hausman test indicates that it is not possible to assume that the unobserved heterogeneity is random. This suggests that the estimates of the Random Effects Model are inconsistent.

Tab. 5 gives an overview on the results of a Moran's I test for spatial autocorrelation among the residuals of the model for the different time periods. It indicates that spatial autocorrelation is not a big problem. For the Between Model, the Moran's I demonstrates some negative spatial autocorrelation. This means that units with high and low residuals are clustering to a higher degree than one would expect from chance. In the Fixed Effects Model, the residuals of the year 1984 exhibit a slightly positive spatial autocorrelation.

Among the estimates of the Fixed Effects Model, only two are significant: the share of married women and the policy reform dummy. They both have the expected sign, and the policy reform of 1986 covariate is highly significant. In general, the model indicates

that the policy reform had at least a short-term effect on the fertility development. Unfortunately, the considerable inflow of Germans and foreigners from East Germany and Eastern Europe after 1987 makes the assessment of medium- and long-term effects practically impossible, as it is very difficult to disentangle the effects of these migration trends from those of the policy reform.

**Tab. 4: Model Results: Policy Reform 1986 – Dependent Variable: TFR**

| Variable | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | Between | | Fixed Effects | | Random Effects | |
| | ß | T | ß | T | ß | T |
| Percentage w. *Abitur* (Females 25–30y.)$_{C1987}$ | 0.005 | 1.07 | – | – | −0.003 | −0.82 |
| Percentage Married (Females 18–50y.)$_{t-1}$ | 0.019 * | 2.30 | 0.016 ^ | 1.92 | 0.010 * | 2.55 |
| Unemployment Rate (State of Bremen)$_{t-1}$ | – | – | −0.003 | −0.37 | −0.009 * | −2.26 |
| Percentage Foreign (Females 15–45y.)$_{t}$ | 0.016 | 1.63 | 0.007 | 0.69 | 0.021 ** | 3.15 |
| Migration Balance (Females 25–50y.)$_{t-1}$ | −0.007 * | −2.57 | 0.000 | 1.02 | −0.000 | −0.15 |
| Rent per m²$_{C1987}$ | 0.010 | 0.16 | – | – | 0.027 | 0.50 |
| Policy Reform (1981–85:0; 1986–87:1) | – | – | 0.153 *** | 5.30 | 0.136 *** | 5.57 |
| Intercept | −0.384 | −0.48 | – | – | 0.328 | 0.65 |
| **Diagnostics** | | | | | | |
| R-squared | 0.74 | | 0.24 | | 0.34 | |
| F(df,n) | 10.00** | | 10.22** | | 13.70*** | |
| Hausman | 13.89* | | 33.41*** | | | |
| Chow-Test F | | | Ind.: 1.06<br>Time: 0.98 | | | |
| Honda | | | | | | |
| Significance codes: 0 *** 0.001 ** 0.01 * 0.05 ^ 0.1 1 | | | | | | |

Source: SLB (2008a), own calculations

It is possible to model a positive interaction effect between the percentage of married people and the policy reform. One reason for this might be that the 1986 reform favored married couples, as the share of economically inactive mothers who became eligible for the parental leave support was likely higher among married women than among unmarried women. In addition, the tax exemptions were in general more supportive for married couples. No interaction effect between the share of foreigners and the policy reform can be identified. This is somehow surprising, as the descriptive findings indicate a substantial increase of the TFR of foreigners in the year after the implementation of the 1986 reform. One reason for these model results might be that the composition of foreigners widely differs in the quarters of Bremen. This is supported by the finding that it is possible to model a positive interaction effect between the share of foreigners and the policy reform, if we run the model only with the Cluster-2 quarters.

If the two clusters are modeled separately, only the model for the Cluster-2 quarters returns a significant effect for the policy reform. This indicates that the policy had in general only limited effects in the Cluster-1 quarters.

**Tab. 5: Moran's I Test for the Residuals of the Models (Policy Reform 1986)**

| | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| **Between** | | | | | | | |
| **Moran's I** | | | | -0.31^ | | | |
| **Fixed Effects** | | | | | | | |
| **Moran's I** | -0.06 | -0.03 | -0.22 | 0.23^ | 0.11 | 0.15 | -0.09 |
| **Random Effects** | | | | | | | |
| **Moran's I** | -0.13 | -0.12 | -0.17 | 0.10 | -0.06 | 0.13 | -0.04 |
| Significance codes: 0 *** 0.001 ** 0.01 * 0.05 ^ 0.1 1 | | | | | | | |

Source: SLB (2008a), own calculations

With regard to the child benefit reform of 1996, the years 1993 to 1999 were chosen for the Panel Model. The year 1993 was taken as starting year as the inflow of in-migrants from East Germany and Eastern Europe had already fallen off substantially at that time. The end year was chosen to avoid having in the model the effects of the family policy reform of 2000, in which the tax exemption was substantially raised.

**Tab. 6: Model Results: Policy Reform 1996 – Dependent Variable: TFR**

| **Variable** | **Model 1** | | **Model 2** | | **Model 3** | |
|---|---|---|---|---|---|---|
| | **Between** | | **Fixed Effects** | | **Random Effects** | |
| | **ß** | **T** | **ß** | **T** | **ß** | **T** |
| Percentage Married (Females 18-50y.)$_{t-1}$ | 0.011 *** | 3.53 | 0.017 ^ | 1.79 | 0.014 *** | 6.28 |
| Unemployment Rate (State of Bremen)$_{t-1}$ | - | - | 0.010 | 1.03 | 0.006 | 0.77 |
| Female Labor Force Part. Rate 1999 | 0.000 | -0.01 | - | - | -0.008 | -1.21 |
| Income/ Capita 2001 (Pop. > 15 y.) (log) | -0.192 * | -2.07 | - | - | -0.189 ** | -2.76 |
| Percentage Foreign (Females 15-45y.)$_{t}$ | 0.022 *** | 3.29 | -0.007 | -0.68 | 0.012 * | 2.17 |
| Migration Balance (Females 25-50y.)$_{t-1}$ | 0.005 | 1.55 | 0.000 | 0.34 | 0.000 | 0.52 |
| Policy Reform (1993-95:0; 1996-99:1) | - | - | 0.092 ** | 3.13 | 0.088 ** | 2.98 |
| Intercept | 2.200 | 1.86 | - | - | 2.379 * | 2.55 |
| **Diagnostics** | | | | | | |
| R-squared | 0.91 | | 0.18 | | 0.57 | |
| F(df,n) | 46.01*** | | 7.04* | | 36.23*** | |
| Hausman | 4.51 | | 8.77 | | | |
| Chow-Test F | | | Ind.: 1.18<br>Time: 0.74 | | | |
| Honda | | | | | 6.25*** | |
| Significance codes: 0 *** 0.001 ** 0.01 * 0.05 ^ 0.1 1 | | | | | | |

Source: SLB (2008a), own calculations

The Hausman test suggests in this case that the estimates of the Random Effects model are also consistent (Tab. 6). According to the Moran's I test, there is some significant spatial autocorrelation among the residuals of the Fixed and the Random Effects Models in the years 1993 and 1994 (Tab. 7). But in the other years, there is no indication of substantial spatial autocorrelation. The Between Model shows that the share of foreign females and the percentage of married people both have highly significant effects on the level of the TFR. In the Fixed Effects Model, only changes in the percentage of married people are slightly positively associated with changes in the TFR. In the Random Effects

Model, the percentage of married people has a highly significant positive effect, as does the average income per capita of the population aged 15 and older. Both the Fixed and the Random Effects Model return a significant positive effect of the policy reform on fertility development. If the two clusters are modeled separately, again only the model with the Cluster-2 quarters returns a significant effect of the policy reform.

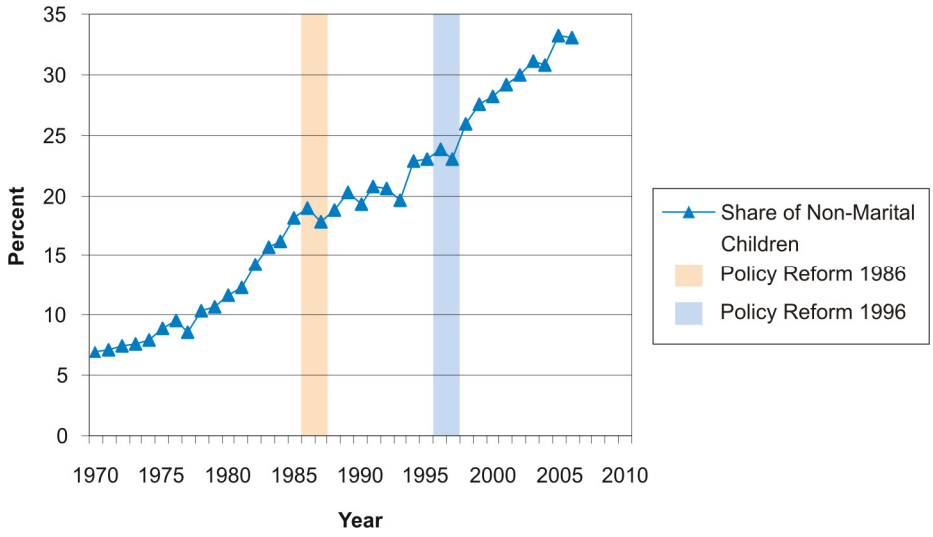
**Tab. 7: Moran's I Test for the Residuals of the Models (Policy Reform 1996)**

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|
| **Between** | | | | | | | |
| **Moran's I** | −0.09 | | | | | | |
| **Fixed Effects** | | | | | | | |
| **Moran's I** | 0.31 ** | −0.38 * | −0.12 | 0.04 | 0.07 | −0.00 | 0.08 |
| **Random Effects** | | | | | | | |
| **Moran's I** | 0.23 * | −0.38 * | −0.17 | −0.08 | 0.08 | −0.04 | 0.12 |
| Significance codes: 0 *** 0.001 ** 0.01 * 0.05 ^ 0.1 1 | | | | | | | |

Source: SLB (2008a), own calculations

In contrast to the 1986 model, neither the Fixed nor the Random Effects Model return a significant interaction effect between the share of married people and the policy reform. But this is not surprising as the 1996 reform was not particularly favorable for married couples. This line of argumentation is also supported by the development of the share of non-marital births (Fig. 9). In general, this share has increased from 7% in 1970 to 33% in 2006. This upward trend has been steady since the mid-1970s, except from the period after 1986, when it stayed relatively stable for approximately six years. This might have been an effect of the policy reform if it is true that these changes were especially supportive of married couples.

**Fig. 9: Share of Non-Marital Births (1970–2006)**

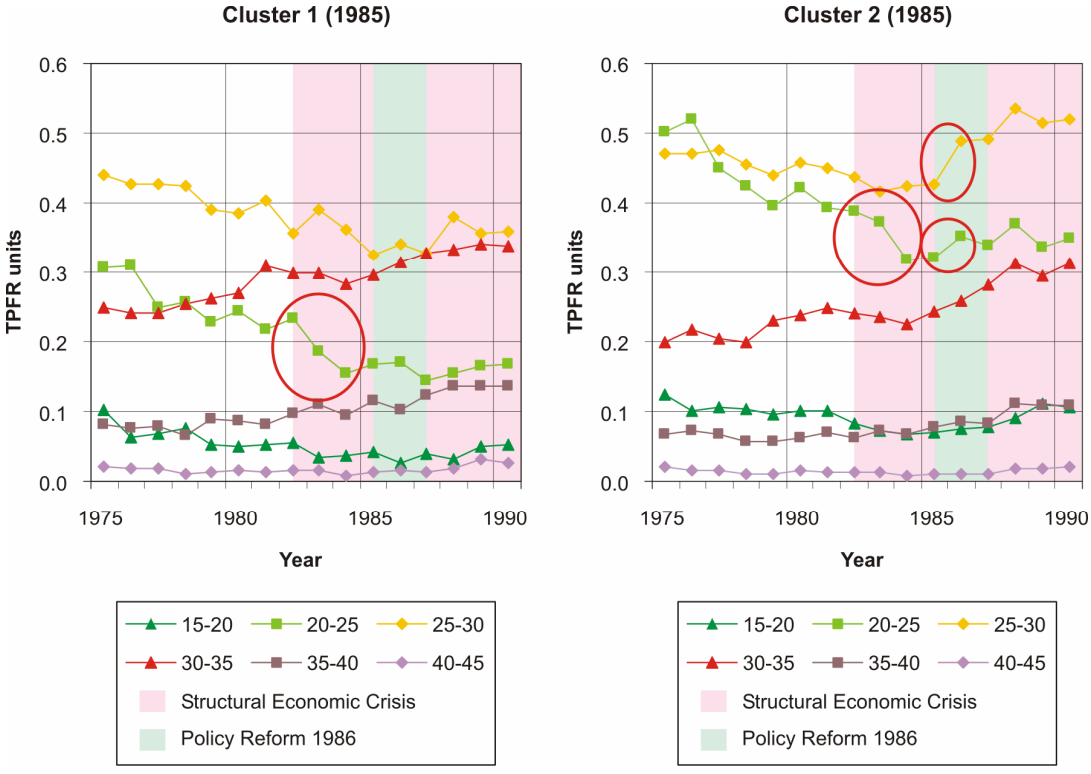



Source: SLB (2008a)

**Why Do the Models Return a Significant Policy Effect?**

The results of the Spatial Panel Models indicate that the policy reforms of 1986 and 1996 had, at least in the short-term, a significant positive effect on the TFR. The descriptive analysis suggests that most of the increase occurred in the first year immediately after the reform. Both reforms were enacted in the middle of a long economic crisis, and were aimed at supporting parents financially and/or helping them balance family and work. It is not unlikely that the economic crisis created a substantial pool of people with childbearing plans who did not proceed with their plans because of the financial uncertainties. This view is also supported by the development of the age-specific fertility rate, which is displayed in Figure 10.

**Fig. 10: Development of Age-Specific Fertility Rates (1975-1990)**[5]




Source: SLB (2008a)

Parallel to the onset of the economic crisis in the beginning of the 1980s, the fertility in the age group 20-25 year declined. Youth unemployment, which was a major problem at that time, was partly the result of the unfavorable economic development, and was partly caused by the entry of the baby boom generation into the labor market (see, for example, Clement, 1985, p. 208). The data supports the view that the crisis had a negative impact on fertility. This might have created a substantial pool of people in this age group who had childbearing intentions, but who did not realize them because of the bad economic outlook. It is not unlikely that the policy reform was under these circumstances able to

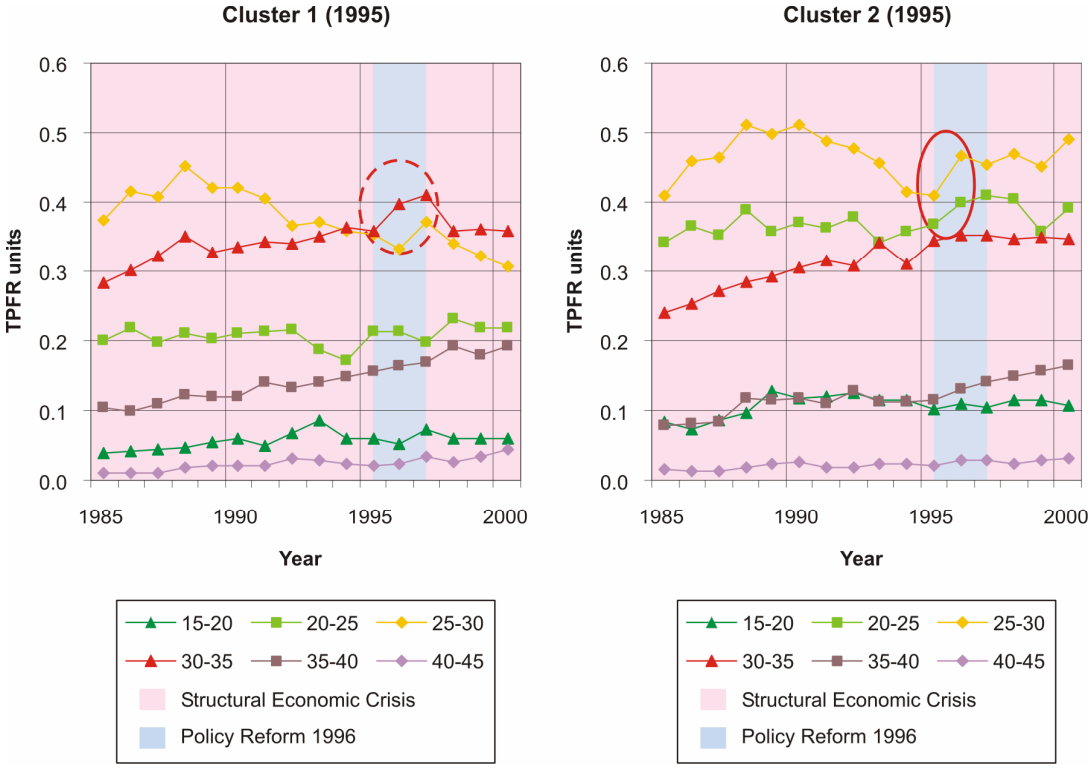
[5] The clusters are based on the outcome of the Cluster Analysis using the data from the mid-1980s.

create conditions in which many of those people finally decided to move forward with their childbearing plans. In support of this hypothesis is the finding that the age group 25-30 showed the greatest increase, mirroring the decrease among the 20-25 year-olds in the early 1980s.

The fact that there was hardly any change in the fertility levels in the Cluster-1 quarters was probably caused by the gentrification process and the expansion of the higher education institutions, which gained pace in the 1980s. These processes most likely reduced the pool of women in these quarters for whom economic reasons were the dominant constraint in having a(nother) child.

One reason why the effect of the 1986 reform was particularly strong among foreigners could be that, with the policy reform, economically inactive women also became eligible to receive support. It is likely that the share of this group was particularly large among foreigners. This conjecture cannot, however, be verified with macro data.

**Fig. 11: Development of Age-Specific Fertility Rates (1985-2000)**[6]




Source: SLB (2008a)

The policy reform of 1996 was also enacted shortly after an intensification of the economic crisis, which had caused a decline in the age-specific fertility rates, especially among the 25-30-year-old women in the Cluster-2 quarters. After the reform, particularly

[6] The clusters are based on the outcome of the Cluster Analysis using the data from the mid-1990s.

the age-specific fertility rates of the 25-30-year-olds in the Cluster-2 quarters increased significantly (see Fig. 11).

The fact that no effect can be observed in the upper class and university graduate quarters can be interpreted in two ways. One is that economic constraints might not be dominant in limiting childbearing behavior in these areas. Second, the policy reforms were, due to their design, perhaps not able to reach the population in these quarters. This might especially be the case for the parental leave reform of 1986, as the parental leave benefit was, at 600 DM per month, not very high. Especially for the dual-earner couples with high incomes and high levels of human capital who are more likely to live in the Cluster-1 quarters, this amount would hardly have been enough to compensate for the loss of income which occurs if one of the partners is not able to participate fully in the labor market.

With regard to the strong positive increase of the TFR of foreigners in the years after a family policy reform, no signs could be found that changes in the selective in-migration regimes played a substantial role in this development. Therefore, the analysis suggests that foreigners were especially likely to react to these policy reforms.

As for the underlying mechanism, both cultural as well as socioeconomic factors might play a role. An explanation based on cultural arguments could be that foreigners, who in Bremen are predominantly of Turkish origin, are more child-oriented than Germans. This could be one reason why they are more likely to react to these family policy reforms. A socioeconomic line of argumentation is that foreigners were, at the time of the reforms, particularly limited in their childbearing behavior by economic constraints. This assumption is also supported by unemployment data for West Germany, which shows that the unemployment rate of foreigners was in both periods substantially higher than that of the German population. In 1986, the unemployment rate among Germans was 9.0%, compared with 13.7% among foreigners. In 1996, the unemployment rate of foreigners in West Germany was, at 18.4%, twice as high as that of the German population (BfA, 2009b, Tab. 1.1 & Tab. 2.3.1).

**Conclusion**

The results of the analysis suggest that the family policy reforms of 1986 and 1996, both of which were intended to reduce the financial burden of raising children, and/or facilitate the desire to balance family and work, indeed had, at least in the short-term, a positive effect on the TFR. But this significant effect can basically only be found in quarters with a low percentage of highly educated females, and a high percentage of foreigners and married women.

The development of the age-specific fertility rates suggests that the economic spatio-temporal setting played an important role in preparing the ground in which these

kinds of family policy reforms could have an effect on the TFR. In both reform periods studied, the reform was enacted relatively shortly after the onset or intensification of an economic crisis. It seems that the latter increased the pool of people who temporarily postponed childbearing mainly for economic reasons. Without the crisis, this pool would have probably been much smaller, making a significant short-term effect of a policy reform less likely.

The findings support the Theory of Risks and Opportunity because uncertainty, which is particularly high in crisis situations, seems to have an impact on childbearing behavior. Family policy reforms that increase financial support for families seem to help alleviate these uncertainties.

With regard to the methodological framework, it can be concluded that the Spatial Panel Analysis with small-scale macro data is a crude, but useful alternative if there is no data available to carry out a Multilevel Event History Analysis. However, among the significant variables in the models, all are related to individual-level characteristics. Taking this into account, one could argue that the results of the analysis suggest that an individual-level analysis without controlling for the spatial context might be preferable to a Spatial Macro Analysis, if both approaches are possible given the available data.

**Acknowledgements**

The author thanks Gerda Neyer, Sandra Krapf, Sunnee Billingsley, Nora Sanchez-Gassen, and the members of the Population and Policy Laboratory of the Max Planck Institute for Demographic Research for valuable comments on earlier versions of the paper. Gratitude is also expressed to Jutta Gampe, Carlo Giovanni Camarda, and Matthias Dettendörffer for their helpful remarks on the statistical models.

**Literature**

Amin, A. (ed.) (1994): Post-Fordism : A Reader. Oxford.

Andersson, G. (2004): Childbearing after Migration : Fertility Patterns of Foreign-Born Women in Sweden. In: International Migration Review 38, pp. 747 – 775.

Baltagi, B.H. (2001): Econometric Analysis of Panel Data. 2nd ed. Chichester.

Becker, G.S. (1960): An Economic Analysis of Fertility. In: National Bureau of Economic Research (ed.): Demographic and Economic change in Developed Countries : A Conference of the Universities-National Bureau for Economic Research. Special Conference Series 11. Princeton, pp. 209 – 231.

Becker, G.S. (1991): A Treatise on the Family. Cambridge.

Bernardi, L. / Klärner, A. / von der Lippe, H. (2008): Job Insecurity and the Timing of Parenthood : a Comparison between Eastern and Western Germany. In: European Journal of Population 24, pp. 287 – 313.

BfA [Bundesagentur für Arbeit] (2009a): Arbeitslosenquoten : Monats-/ Jahreszahlen 2008. Nürnberg.

BfA [Bundesagentur für Arbeit] (2009b): Arbeitslosigkeit im Zeitverlauf : Juni 2009. Nürnberg.

Birg, H. / Flöthmann, E.-J. / Fuhrmann, A. / Genz, M. / Loos, R. / Pilk, S. (2007): Frauenerwerbsquote und Fertilität in Deutschland - Regionalanalyse der 439 Land- und Stadtkreise : Zusammenfassung der Ergebnisse und Arbeitsmaterialien. Bielefeld. In: www.herwig-birg.de/downloads/dokumente/feq.pdf. 15.07.2009.

BKG [Bundesamt für Kartographie und Geodäsie] (2007): Verwaltungsgrenzen 1 : 250.000 – VG250. Frankfurt.

Blossfeld, H. / Huinink, J. (1991): Human Capital Investments or Norms of Role Transition? How Women's Schooling and Career Affect the Process of Family Formation. In: The American Journal of Sociology 97, pp. 143 – 168.

BMF [Bundesministerium für Finanzen] (2007): Datensammlung zur Steuerpolitik : Ausgabe 2007. Berlin.

Borg, M.O. (1989): The Income--Fertility Relationship: Effect of the Net Price of a Child. In: Demography 26, pp. 301 – 310.

Buttner, T. / Lutz, W. (1990): Estimating Fertility Responses to Policy Measures on the German Democratic Republic. In: Population and Development Review 16, pp. 539 – 555.

Carstairs, V. (1981): Small Area Analysis and Health Service Research. In: Community Medicine 3, pp. 131 – 139.

Clement, W. (1985): Is the Dual System Responsible for Low Youth Unemployment in the Federal Republic of Germany? In: European Journal of Education 20, pp. 203 – 219.

Cliff, A.D. / Ord, J.K. (1981): Spatial Processes : Models and Applications. London.

de Beer, J. / Deerenberg, I. (2007): An Explanatory Model for Projecting Regional Fertility Differences in the Netherlands. In: Population Research and Policy Review 24, pp. 359 – 385.

Duncan, C. / Jones, K. (2000): Using Multilevel Models to Model Heterogeneity : Potential and Pitfalls. In: Geographical Analysis 32, pp. 279 – 305.

Engelhardt, H. / Kögel, T. / Prskawetz, A. (2004): Fertility and Women's Employment Reconsidered : A Macro-Level Time Series Analysis for Developed Countries, 1960-2000. In: Population Studies 58, pp. 109 – 120.

Fotheringham, A.S. / Brunsdon, C. / Charlton, M. (2002): Geographically Weighted Regression : The Analysis of Spatially Varying Relationships. Chichester.

Frejka, T. / Hoem, J. / Sobotka, T. / Toulemon L. et al. (2007): Childbearing Trends and Policies in Europe : Is a new Demographic Disequilibrium Emerging? Presentation at the PAA Annual Meeting in New York, March 29-31, 2007. Princeton. In: paa2007.princeton.edu/download.aspx?submissionId=71090. 15.07.2009.

Gauthier, A.H. (2007): The Impact of Family Policies on Fertility in Industrialized Countries : A Review of the Literature. In: Population Research and Policy Review 26, pp. 323 – 346.

Hank, K. / Kreyenfeld, M. (2003): A Multilevel Analysis of Child Care and Women's Fertility Decisions in Western Germany. In: Journal of Marriage and Family 65, pp. 584 – 596.

Hank, K. / Kreyenfeld, M. / Spiess, C.K. (2003): Kinderbetreuung und Fertilität in Deutschland. Rostock. MPIDR Working Paper WP 2003-002.

Hausman, J. A. (1978): Specification Tests in Econometrics. In: Econometrica 46 (6), pp. 1251 – 1271.

Hauß, J. (2003): Indexprobleme im Zugewinnausgleich. In: Der Familienrechtsberater 2, pp. 310 – 311. In: www.famrb.de/indexprobleme.pdf. 15.07.2009.

Kögel, T. (2004): Did the Association between Fertility and Female Employment within OECD Countries Really Change its Sign? In: Journal of Population Economics 17, pp. 45 – 65.

Kohler, H.-P. / Ortega, J.A. (2002): Tempo-Adjusted Period Parity Progression Measures, Fertility Postponement and Completed Cohort Fertility. In: Demographic Research 6, pp. 99 – 144.

Kolbe, W. (2002): Elternschaft im Wohlfahrtsstaat : Schweden und die Bundesrepublik im Vergleich 1945-2000. Frankfurt.

Konietzka, D. / Kreyenfeld, M. (2002): Women's Employment and Non-Marital Childbearing : A Comparison between East and West Germany in the 1990s. In: Population (English Edition) 57, pp. 331 – 357.

Kravdal, O. (2002): The Impact of Individual and Aggregate Unemployment on Fertility in Norway. In: Demographic Research 6, pp. 261 – 293.

Kreyenfeld, M. / Mika, T. (2008): Erwerbstätigkeit und Fertilität : Analysen mit der Versicherungskontenstichprobe der deutschen Rentenversicherung. In: Deutsche Rentenversicherung Bund (Hg.): Die Versicherungskontenstichprobe als Scientific Use File : Workshop des Forschungsdatenzentrums der Rentenversicherung (FDZ-RV) am 30. und 31. Oktober 2007 in Würzburg. Berlin, pp. 71 – 95.

Kulu, H. (2005): Migration and Fertility : Competing Hypothesis Re-Examined. In: European Journal of Population 21, pp. 51 – 87.

Lappegård, T. / Rønsen, M. (2005): The Multifaceted Impact of Education on Entry into Motherhood. In: European Journal of Population 21, pp. 31–49.

McDonald, P. (2001): Theory pertaining to low fertility. Paper presented at the conference International Perspectives on Low Fertility : Trends, Theories and Polices, Tokyo, 21-23 March 2001.

Michielin, F. (2002): Lowest Low Fertility in an Urban Context : When Migration Plays a Key Role. Rostock. MPIDR Working Paper 2002-050.

Neyer, G. / Andersson, G. (2008): Consequences of Family Policies on Childbearing Behavior : Effects or Artifacts? In: Population and Development Review 34, pp. 699 – 724.

Pierson, P. (2004): Politics in Time : History, Institutions, and Social Analysis. Princeton.

Richter, A. (2006): Einzeldaten der Bevölkerungsstatistik : Die natürliche Bevölkerungsbewegung in Deutschland. In: Statistisches Monatsheft Baden-Württemberg 12/ 2006, pp. 11 – 16.

Rindfuss, R.R. / Guzzo, K.B. / Morgan, S.P. (2003): The Changing Institutional Context of Low Fertility. In: Population Research and Policy Review 22, pp. 411 – 438.

Rindfuss, R.R. / Guilkey, D.K. / Morgan, S.P. / Kravdal, Ø / Guzzo, K.B. (2007): Child Care Availability and First-Birth Timing in Norway. In: Demography 44, pp. 345 – 372.

Robinson, W.S. (1950): Ecological Correlations and the Behavior of Individuals. In: American Sociological Review 15, pp. 351 – 357.

SB [Statistisches Bundesamt] (2007): Preise : Verbraucherpreisindex und Index der Einzelhandelspreise : Jahresdurchschnitte ab 1948. Wiesbaden.

Schoorl, J. (1995): Fertility Trends of Immigrant Populations. In: Voets, S. / Schoorl, J. / de Bruijn, B. (eds.): The Demographic Consequences of International Migration : Proceedings of the Symposium, NIAS, Wasenaar, 27-29 September 1990. Report Not. 44. The Hague, pp. 97 – 121.

SLB [Statistisches Landesamt Bremen] (2006): Studierende und Studienanfänger an den Hochschulen des Landes Bremen im Studienjahr 2005 (SS 2005 und WS 2005/ 2006). Bremen. In: www.statistik.bremen.de/sixcms/media.php/13/BIII1_2005_Studierende_Studienanfaenger.pdf. 15.07.2009.

SLB (2007): Berufliche Bildung im Lande Bremen 2006. Bremen. In: www.statistik.bremen.de/sixcms/media.php/13/BII5_7_2006%20Berufliche_Bildung%20.pdf. 15.07.2009.

SLB (2008a): Bremen kleinräumig Infosystem. In: www.statistik-bremen.de/soev/statwizard_step1.cfm. 15.07.2009.

SLB (2008b): Studierende und Studienanfänger an den Hochschulen des Landes Bremen (Ohne Beurlaubte, Gast- und Nebenhörer sowie ohne Kontaktstudenten). In: www.statistik-bremen.de/aktuelle_statistiken/09a.htm. 15.07.2009.

SLB (2008c): Bremen Infosystem. In: www.statistik-bremen.de/bremendat/statwizard_step1.cfm. 15.07.2009.

Sobotka, T. (2004): Postponement of Childbearing and Low Fertility in Europe. Groningen.

Thelen, K. (1999): Historical Institutionalism in Comparative Politics. In: Annual Review of Political Science 2, pp. 369 – 404.

Tremmel, J. (2005): Bevölkerungspolitik im Kontext ökologischer Generationengerechtigkeit. Stuttgart.

Wauschkuhn, (1998): Strukturwandel und standortpolitischer Handlungsbedarf im Land Bremen. Bremen. Materialien des Universitätsschwerpunktes „Internationale Wirtschaftsbeziehungen und Internationales Management“ 15. In: www.iwim.uni-bremen.de/publikationen/pdf/w015.pdf. 15.07.2009.

Zukin, S. (1987): Gentrification : Culture and Capital in the Urban Core. In: Annual Review of Sociology 13, pp. 129 – 147.