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# Fertility Data for German-speaking Countries: What is the Potential? Where are the Pitfalls?

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**Abstract:** This paper provides an overview of fertility data for Germany, Austria and Switzerland. Particular attention is given to the availability of order-specific fertility data. We discuss the quality of data provided by the Statistical Offices, both birth registration data and censuses or microcensuses. In addition, we explore how social science surveys can be used to generate order-specific fertility indicators, and compare survey fertility estimates with estimates from vital statistics. Prior studies have shown that there is a "family bias" in most surveys, with the fertility of younger cohorts being overstated, because respondents with young children are easier to reach by interviewers. Our assessment of various types of surveys from the three countries mostly supports this notion. The "family bias" is most pronounced in family surveys in contrast to all-purpose surveys. Weighting data does not fully cure the "family bias", which we attribute to the fact that the number of children is usually not considered a factor in calculating sample weights, as provided by the survey agencies and Statistical Offices. The confounding role of migration in the production of reliable and comparable fertility statistics is also discussed.

**Keywords:** Fertility · Germany · Austria · Switzerland

## 1 Introduction

Fertility measures – such as the total number of children, the share of childlessness or the mean age at childbirth – are key indicators of demographic behaviour of a population. These indicators are regularly published by national Statistical Offices and they are also included in international demographic databases (e.g. Council of Europe, the United Nations Populations Division and Eurostat). Fertility measures derived from vital statistics are assumed to be of high quality as events like births are precisely recorded by official registrars and because they cover the total


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population. However, the desired level of detail is commonly not covered in vital statistics. This is particularly true for Austria, Germany and Switzerland. In these countries vital statistics did not, until recently, provide order-specific fertility information. Consequently, important demographic indicators, such as the mean age at first birth or the level of childlessness, could not be generated.

In recent years, the collection of vital statistics has been expanded in scope, and the Statistical Offices of Austria, Germany and Switzerland are now registering births by biological order: the reforms were implemented in 1984, 2008 and 1998 respectively. However, since these are recent improvements, we do not have long time series of order-specific birth behaviour. Neither can we derive cohort-specific data from birth registration data, because one needs data for the entire reproductive life of a cohort in order to, for example, generate the prevalence of childlessness by birth cohort. Given these shortcomings of vital statistics, the question arises as to whether other types of data, such as survey data, are able to provide reliable fertility indicators.

The chief aim of this paper is to provide an overview of order-specific fertility data that are available from vital statistics and population censuses for the three (predominantly) German-speaking countries: Germany, Austria and Switzerland. Moreover, we seek to answer the question: which additional data sources are available to generate order-specific fertility indicators? Do social science surveys provide robust and reliable indicators? Is there systematic bias in survey data?

The paper is structured as follows. After a general discussion of concepts, definitions and methods, an overview of the data sets available for each country is presented. In addition to presenting the different estimates of mean number of children, birth-order specific data is also compared. The final section evaluates the data situation in the three countries.

The scope of this paper is limited to fertility indicators by birth order. We do not address more refined fertility measures, such as fertility by education or migration background. Also, we are only concerned with fertility indicators that summarise the behaviour of women. Male fertility is not addressed. Furthermore, we only consider live-born children which means that we disregard adoption, step- or foster parenthood.

## 2 Research question, method and data

Fertility indicators can be derived from vital statistics data, register data and from survey data. *Vital statistics* include births that were derived from the vital registration system. In order to generate birth rates, these data need to be related to the female population. In the countries considered here, birth counts and population counts are gathered independently. The accuracy of the derived fertility rates is dependent on the quality of both data sets and on the exact equivalence of the observed population. *Register data* (ideally) contain complete fertility histories of a population. The German pension registers are an example of this type of data. The Austrian census in 2011 was register-based and included fertility data. *Survey*

*data* include an assessment of either the complete population or a subset of the population who are questioned regarding their achieved fertility up to the interview. For all countries under consideration, there are some census or Mikrozensus data available. Additionally, various smaller social science surveys exist that provide fertility information. We classify surveys into "family surveys" and "multi-purpose surveys". We also follow the standard distinction between "cross-sectional surveys" and "panel studies".

Vital statistics are generally used to calculate period fertility rates, while survey data and other types of register data are typically used for generating cohort fertility indicators. If there is a sufficiently long series of period data from vital statistics, then cohort fertility can be estimated from period observations, too. For Germany and Switzerland, vital statistics do not provide a long time series of order-specific fertility rates. As such, the question arises as to whether survey data are able to close the gap left by the vital statistics of the three countries under consideration.

Various assessments of surveys for deriving fertility indicators have been made in the past, examining for example the United States fertility surveys (*Swicegood et al.* 1984); the Italian Fertility and Family Survey (FFS) and Multiscopo (*Rendall et al.* 1999); the German Mikrozensus (*Pötzsch* 2010) and the German Generations and Gender Survey (GGS) (*Kreyenfeld et al*. 2010a); the GGS of Bulgaria, Hungary and Georgia (*Burkimsher* 2009); and FFS data from the 24 participating countries (*Festy/Prioux* 2002). While these studies have primarily focused on the female population, attempts have also been made to validate male responses in surveys *(Rendall et al.* 1999). There is some concern regarding the accuracy of responses of unmarried men who seem to underreport children with whom they do not co-reside. Nevertheless, a general presumption of these studies is that the birth of a child is a hard fact in a person's life. Compared to employment or residential histories, it should therefore be possible to collect fertility histories without much decrement in data quality.

However, fertility indicators derived from surveys suffer several limitations. In most cases sample sizes are too small and time periods too short to demonstrate long time trends or to cover many birth cohorts. Furthermore, fertility information is mostly gathered retrospectively. Only respondents that have survived up to the time of interview can be covered in surveys and selection upon survival might bias fertility estimates (*Murphy* 2009). Surveys invariably disregard the mobile population who has left the country before the interview, but include people who might not have lived in the respective country their whole reproductive life. This means that cohort fertility estimates based on survey data must, by definition, deviate from vital statistics, because the study population differs. Additionally, surveys suffer from unit- and item- non-response. And, most importantly, individuals with certain socio-demographic characteristics may be under-represented or over-represented in the sample. In particular, women with children tend to be over-sampled in social science surveys, because it is easier for interviewers to reach them at home where they care for their children (*Festy/Prioux* 2002). This might be most severe in family surveys for which it will be easy to motivate respondents with children, while child-

less respondents will be reluctant to participate because they are of the opinion that the theme of the survey is not relevant to them.

These considerations suggest that there tends to be a systematic "family bias" in survey data. It raises the question as to what extent social science surveys can be used to provide reliable indicators for fertility research and whether weights are able to correct for this bias. Therefore, an evaluation is important for assessing the degree of reliance that can be put on survey data.

### *Method*

In order to asses whether there is a "family bias" in the social science surveys, we have compared fertility indicators across surveys. We also compared estimates from survey data with estimates from vital statistics and censuses, if available. The key indicators that we have used for comparison are the *mean number of children* and the *parity distribution*, particularly the *proportion of childless women* by birth cohort. The analysis has been restricted to female respondents with valid information on their number of biological children. If a child was born in the year of the survey, we have disregarded this birth. In other words, we have censored the observations in the year before the interview. The reason for this procedure is that we compared fertility estimates from surveys to fertility estimates from vital statistics. While surveys are usually conducted over a longer span of time, fertility information from the vital statistics usually refers to a calendar year. Censoring the survey data at the end of the year before interview makes both data sets comparable, which is of importance especially for the cohorts who are of childbearing age. As sample sizes are rather small in the surveys, we have grouped the data into five-year cohorts. Unless noted otherwise, we have provided weighted and unweighted estimates. There is a similarity in methodology across surveys and countries: the weights usually only account for standard socio-economic characteristics (such as age, education and marital status). However, number of children is not included in "standard" weighting schemes. This issue is discussed in more depth later.

### *Data*

Many of the data sources are country-specific, but data from some multi-country databases and surveys are also available. The *Fertility and Family Surveys (FFS*) programme, organised by the Population Activities Unit of the United Nations Economic Commission for Europe (PAU UNECE), collected during the 1990s individual data on household characteristics, parental home, partnership characteristics and partnership history, children and fertility histories, fertility regulation, views on children, education and educational history, occupational history, and values and beliefs of respondents (*FFS* 1996, 1999). Data were collected in 24 UNECE Member States including Germany, Austria and Switzerland.

The follow-up to the FFS is the *Generations and Gender Survey (GGS)*, although fewer countries are currently participating than in the FFS (United Nations ECE 2005). It is envisioned as a three wave panel survey, with waves taking place three

years apart. Germany has completed the first and second wave and Austria the first wave (the second one is in preparation). The Swiss Federal Statistical Office plans to carry out a similar Family and Generations Survey in 2013.

The *European Social Survey* (ESS) (*Jowell et al.* 2007) is a general purpose social survey which takes place every two years; so far just the third wave, that of 2006/2007, has included a question on fertility. Germany, Austria and Switzerland all gathered data in the ESS wave 3.

## 3 Germany

### 3.1 Vital statistics and census data

Fertility data in Germany is collected by the Statistical Offices of the "Länder" who forward the data to the German Statistical Office (Statistisches Bundesamt) which then publishes some of the birth statistics online.[1] Due to its specific history, which was marked by significant territorial changes, the data do not cover a long period. For example, live births are only available for the time since 1950. Birth data are made available by standard characteristics such as age, sex, region, and citizenship of the mother. However, German vital statistics did not provide birth counts by biological order until recently.[2] Only births by order in the current marital union were available. This situation has improved recently since the "German Population Statistics Law" (*Bevölkerungsstatistikgesetz*) was changed and prescribed that from 2008 onwards births were to be collected by biological order. Since the data quality for 2008 was not good enough this data has not been released. However, fertility data from 2009 onwards is available by biological birth order. A valuable feature of the German vital statistics is that data from the birth registers are also available as individual records. Data for the years 2001-2009 can be analysed on-site or via remote access to the Research Data Centres of the Federal Statistical Office and the statistical offices of the Federal States. The latter data is (so far) only available for non-order specific data.

Germany is providing fertility data to the Human Fertility Database (*HFD Germany* 2010). Data in this data base are provided for East Germany, West Germany and for Germany as a whole. Age-specific fertility rates are available from 1952 onwards. Also order-specific fertility data are included for East Germany for the period

1 https://www-genesis.destatis.de

2 For the former East Germany order-specific data were also available for the period from 1954 until 1988 (*HFD Germany* 2010). For West Germany, attempts have been made to generate order-specific birth rates by combining information on the births by order in the martial union with order-specific birth information from surveys (*Kreyenfeld* 2002).

1954-1988.[3] Since 2009, order-specific data are available for Germany as a whole, as well as separately for East and West Germany.

There is also a "Monitor of Births" available for Germany which is hosted by the Rostock Centre for the Study of Demographic Change.[4] It has provided monthly fertility rates since January 2005 for Germany as a whole, as well as for East and West Germany (*Doblhammer et al.* 2011).

Germany is conducting a census in 2011 (*Eppmann et al.* 2006).[5] This census is primarily register-based and will draw on data from the employment registers and the population registers of the municipalities. However, the census will not contain fertility information. Nevertheless, the census has possible implications for fertility researchers as it will provide new estimates of the population size and structure by age and gender. The official population size for Germany was 81.8 million at 31 December 2009 (*Statistisches Bundesamt* 2010). It is expected that the new estimates will be lower. If the base population decreases, fertility rates based on the new data will be a little higher than previously calculated. However, it is difficult to assess the magnitude of this effect as it is unclear to what degree the population counts will change and how different age groups are affected.

Prior censuses of the Federal Republic of Germany, such as the one in 1970, included a question on the number of children, but this information was only collected from married respondents. For the German Democratic Republic, data from the census of 1981 provided data on the full female population by age and parity. These data can be used to compile time series of the distribution of births for the cohorts 1902-1945.

By and large, the availability of order-specific fertility data from German vital statistics has improved tremendously in recent years. In particular, the availability of order-specific fertility data is a landmark change for German birth registration statistics. However, there is still a lack of long time series to understand order-specific fertility behaviour. For Germany, it is difficult to give a conclusive answer to the question of how the mean age at first birth has changed over time. Nor do official birth statistics tell us as yet how the share of childless women has changed across cohorts.

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3 It is, in principle, possible with the HFD to analyse fertility by East and West Germany after 1990, too. However, it needs to be mentioned here that Berlin has not been separated in this database because a regional reform – which came into force in 2001 – makes it difficult to divide Berlin along the old territorial borders of the previous two German states. The question arises as to whether to group Berlin into East Germany or whether to exclude it from the time series. There is no common practice in fertility research yet. However, it needs to be noted that the inclusion of West Berlin into East Germany somewhat affects the East German birth rate (*Goldstein/Kreyenfeld* 2011).

4 http://www.zdwa.de/zdwa/artikel/index_dateien/index_0407.php

5 https://www.zensus2011.de

### 3.2 Perinatal statistics and pension register

Apart from the vital statistics, Germany also offers other types of register data that can be used for fertility analysis. The register of Perinatal Statistics includes clinical records of children who were delivered in German hospitals. Data are collected on a federal level, and prior to 2001 these data have primarily been used to analyse order-specific fertility patterns in selected federal states (*Voigt*/*Hullen* 2005). Since 2001, the data have been stored in a central register which has opened up the opportunity to use this data for order-specific analysis for the country as a whole (*Kreyenfeld et al.* 2010b).[6] However, this data cannot be used to produce cohort fertility estimates.

The German pension register also provides fertility information with the great advantage that it provides micro-level data of women both with and without children alike. Thus it is possible to generate fertility rates by using just one source of data. This is a great advantage over deriving birth rates from vital statistics as this calculation draws the numerator (births) and the denominator (female population) from two different sources. The other advantage is that exposure rates can be calculated, as the duration since time of last birth is included. However, this data set is still not a full replacement for vital rates, as it does not include the total population of Germany. Certain sub-populations, such as farmers or lifetime-employed civil servants, are not included. Fertility of non-Germans is also not very accurate as children that were born outside Germany are not included in these registers (for an evaluation see *Kreyenfeld*/*Mika* 2008).

### 3.3 Survey data

The major survey data set that provides information on household structure and household composition in Germany is the Mikrozensus. The Mikrozensus is conducted by the German Federal Statistical Office and includes 1 % of all households in Germany. Up to 2008, the Mikrozensus did not include information on the number of children ever born. However, researchers have used this survey to generate fertility information by estimating a fertility schedule based on information about the children living in the household of the respondent at the time of the interview (see e.g. *Duschek*/*Wirth* 2005). The drawback of this procedure has been that children who have died and those who had moved out of the parental home are discounted.

After the recent reform of the Mikrozensus law, a question on the number of children ever born has finally been included into the Mikrozensus. The law stipulates that fertility information should be collected every four years for female respondents aged 15-75. The Mikrozensus 2008 was the first one which provided this

6 Home births, which make up about two percent of all births in Germany, are not included in the Perinatal statistics. However, sensitivity analysis has shown that the omission of these births does not bias order-specific analysis in any substantial manner (*Kreyenfeld et al* 2010b).

information. Most of the questions in the Mikrozensus are compulsory, i.e. respondents are required by law to provide information. Unfortunately, the question on the number of children is not among them and the respondent can choose whether or not to answer this question. Furthermore, the question on the number of children has been placed at the end of the questionnaire, where it is asked rather out of context. These two aspects taken together might explain that the item non-response is unusually high. About 12 % of respondents failed to answer this question in 2008. As it is considered probable that childless respondents more commonly failed to answer this question than others, the Federal Statistical Office has generated an imputation scheme that tries to correct for the bias in the data (*Statistisches Bundesamt* 2009; *Pötzsch* 2010).

### *Social Science Surveys*

Germany has several cross-sectional data sets that contain information on the number of children ever born (Table 1). One of the most recent ones is the *AID:A*, launched by the German Youth Institute in 2009. AID:A is a successor to the DJI-Family Survey that was last undertaken in 2000. The German *Birth Survey* ("Geburten in Deutschland") conducted by the Federal Statistical Office in 2006 contains fertility histories of female respondents (*Statistisches Bundesamt* 2007; *Pötzsch/ Emmerling* 2008). The sample comprises prior respondents of the Mikrozensus.[7] Germany also participated in the *Generations and Gender Survey* (GGS). The first round of the German GGS was undertaken in 2005. The German GGS also includes an oversample of Turks. This subsample was observed in 2006 (*Ruckdeschel et al*. 2006). An evaluation of the German GGS has been undertaken and major flaws in the fertility histories have been diagnosed (*Kreyenfeld et al*. 2010a; *Naderi et al*. 2009). The *German Life History Survey* (GLHS) provides complete fertility histories of female and male respondents for selected birth cohorts (*Mayer* 2006).[8] A very recent and large data set is a study conducted by the Institute for Employment Research entitled *"Arbeiten und Leben im Wandel"* (ALWA). It is primarily geared towards collecting employment careers, but it also includes complete fertility histories of males and females.

Apart from the big family surveys, there are other social science surveys that include fertility information. All purpose surveys such as the *"Allgemeine Bevölkerungsumfrage der Sozialwissenschaften"* (ALLBUS) provide fertility histories; however, sample sizes are rather small. If one aims at reconstructing fertility his-

7 The German Birth Survey is a cross-sectional study which is drawn based on the population of respondents who have previously been interviewed in the Mikrozensus. The Mikrozensus is organized as a rotating panel: ¼ of the respondents are surveyed four years in a row. After four years, respondents usually leave the study population. The German Birth Survey therefore includes respondents who have previously been interviewed in the Mikrozensus four years in a row.

8 http://www.yale.edu/ciqle/GLHS/

tories of older cohorts, data from the *Survey of Health, Ageing and Retirement in Europe* (SHARE), the *Life Expectancy Survey* or the *German Ageing Survey* (DeAS) might be useful (*Börsch-Supan et al.* 2010; *Engstler/Motel-Klingebiel* 2010). However, it is generally only surviving children who are surveyed in these ageing-related data-sets. Germany has also participated in the *Population and Policy Acceptance Survey* (PPAS), the *Eurobarometer* and the *European Social Survey* (EES). These data sets also contain fertility information; however, sample sizes are quite small compared to most of the other data sets.

### *Panel Data*

The availability of panel data in Germany is favourable too. The *Socio-Economic Panel* (SOEP), of which the first wave was launched in 1984, is one of the longest panel studies in Europe and can be used to study the fertility of both males and females (e.g. *Schmitt* 2004). For fertility researchers, it is also of interest that a subsample (SOEP-FIT) was drawn in 2010, containing about 500 households in which a child has been born since 2007. This data collection has been financed by the German Family Ministry and will become available for scientific use in 2013.

The *Mikrozensus* is also available as a panel data set. The great advantage of this data set is that sample sizes are large and unit and item non-responses are very low. A shortcoming is that fertility histories are not surveyed and need to be reconstructed based on information about the children who are living in the household of the respondent. Another drawback is that a person automatically drops out of this panel when he or she moves into another household (*Kreyenfeld et al*. 2009).

There has been a whole series of family panels in Germany. Two of the first were the "Bielefelder family panel", which was launched in the 1980s (*Strohmeier* 1985), and the "Bamberger Ehepaar-Panel", which was conducted in the period 1986-2002 (*Schneewind et al.* 1996). While these early panels comprised rather small sample sizes, the *family panel of the German Youth Institute* was the first large scale family panel in Germany. This data suffered, however, from the fact that the time between panel waves was long which contributed to large sample attrition. The same can be said for the *Generations and Gender Survey* (GGS), of which the first wave was conducted in 2005. The second wave followed in 2008; however, only a third of the respondents of the first wave provided information in the second wave. The *Panel Analysis of Intimate Relationships and Family Dynamics* (pairfam), with a first wave launched in 2008/2009, is the most recent family panel surveying more than 12,000 respondents (*Huinink et al*. 2010). *DemoDiff* (Demographic Differences in Life Course Dynamics in Eastern and Western Germany) complements pairfam with an additional 1,400 East German respondents. Both panels follow an annual rhythm. Pairfam is currently the largest family panel in Europe. It is surveyed on an annual basis and it envisaged to be conducted for 14 years. For family researchers, pairfam is a key micro-data set, as it contains highly reliable panel information combined with several innovative features such as a multi-actor design.[9]

[9] http://www.pairfam.uni-bremen.de

**Tab. 1:** Summary of selected German surveys (by alphabetical order)

| Type of Survey | Year | Sample Size | | Remarks |
|---|---|---|---|---|
| | | Males | Females | |
| ALLBUS[1] | since 1980 | 1,712 | 1,757 | Ages 18+, East Germany oversampled |
| Arbeiten und Leben im Wandel (ALWA) | 2007 | 5,271 | 5,133 | Cohorts 1956-1988 |
| Aufwachsen in Deutschland: Alltagswelten (AID:A) | 2009 | 12,537 | 12,800 | Ages 0-55 |
| Birth Survey (Geburten in Deutschland) | 2006 | -- | 12,456 | Ages 16-75 |
| European Social Survey, wave 3 | 2006/07 | 1,437 | 1,479 | Representative in wave 1 |
| Family Survey of the Youth Institute[2] | 1988, 1990, 2000 | 4,629 | 5,689 | Ages 18-55 |
| Fertility and Family Survey (FFS) | 1992 | 4,016 | 5,996 | Ages 18-38, German nationals |
| Generations and Gender Survey (GGS)[3] | 2005, 2008 | 4,610 | 5,407 | Ages 18-85 |
| Life History Survey (LHS)[4] | First study in 1981 | Total of 11,441 respondents | | Selected cohorts |
| Mikrozensus[5] | since 1957 | 234,711 | 249,711 | All ages |
| Pairfam/DemoDiff | 2008-ongoing (yearly panel) | 6,763 | 7,128 | Cohorts 1971-1973, 1981-1983, 1991-1993 |
| Population Policy Acceptance Study (PPAS) | 2003 | 2,030 | 2,080 | Ages 18-75 |
| Socio-Economic Panel (SOEP)[6] | 1984-ongoing (yearly panel) | 32,991 | 33,192 | Ages 17 and older |

1 The Allbus is available for the years 1980, 1982, 1984, 1986, 1988, 1990, 1991, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006 and 2008. Sample size refers to the year 2008.

2 The East German sample was drawn in 1994/95 and 2000. Part of this data is available as a panel.

3 The GGS is organized as a panel. There is an additional sample that oversamples Turks in Germany. That subsample was drawn in 2006.

4 The life history survey contains several sub-surveys of West German cohorts 1919-21, 1929-31, 1939-41, 1949-51, 1954-56, 1959-61, 1964, 1971 and East German cohorts 1929-31, 1939-41, 1951-53, 1959-61, 1971. Part of the study is organized as a panel. The cohorts were surveyed at various points in time since the 1980s. For the cohorts born before 1964, the samples only contained German nationals.

5 The Mikrozensus has been carried out annually since 1957 for West Germany and since 1991 for East Germany, with the exception of the years 1983 and 1984. For the years 1996-2000 and 2001-2004, the Mikrozensus is also available as a panel. Sample size refers to the Scientific Use File of the year 2008.

6 The SOEP contains an oversample of certain subpopulations such as foreigners and East Germans. It also includes a special questionnaire for mothers of new born children and infants. Also 17-year olds are surveyed separately. Numbers in table refer to the year 2009.

### 3.4 Comparison of fertility estimates from various sources

This section addresses the question of how fertility estimates can be compared across the different German surveys. We have focused on six data sets for this analysis: the SOEP, Birth Survey, GGS, Mikrozensus, DJI-Family Survey and pairfam. We have restricted the comparison to West Germany. The definition of what constitutes West Germany differs somewhat between samples. This issue should be of minor importance as the exclusion of West Berlin does not affect the West German results markedly.

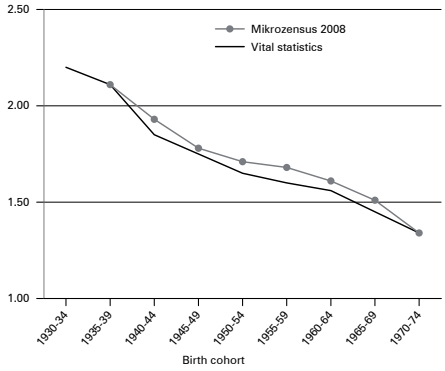
Figure 1 displays the mean number of children by female birth cohorts. There is some variation between how well the different types of surveys depict the overall fertility trend. While the Mikrozensus follows the trend suggested by the vital statistics fairly well, this is not the case for the other surveys. Particularly disturbing are the results for the German GGS which give a wrong impression of the overall trends in fertility (for a detailed discussion see also *Naderi et al.* 2009; *Kreyenfeld et al.* 2010a). It is also worth noting that the "family bias" is more pronounced in the pairfam, the GGS and the DJI-Family Survey, while the bias does not seem as strong in the (weighted) SOEP-data. The SOEP and Mikrozensus are all-purpose surveys which might explain why the bias is less strong than in the family surveys. The Birth Survey would classify as a family survey too; however, in this survey special efforts have been made to address childless respondents, which could explain why the "family bias" is less strong in this data set.

The most important finding from this comparison is that, in all survey data, the bias runs in the same direction. While fertility seems too low for the older cohorts, it is too high for the cohorts who are at childbearing ages at time of survey. Reachability might explain the pattern for the more recent cohorts; however, it is less comprehensible why there is a bias for the older ones. One could speculate that migration could affect the differences between the vital statistics and the survey data more for the older cohorts. One possibility could be that foreign women with larger families who have given birth to their children in Germany, returned to their home countries later in life, perhaps at their own or their partners' retirement age. Another reason for this pattern could be a systematic underreporting of children by the older cohorts. Why underreporting of children is age-dependent is, however, difficult to explain, unless deceased, emigrated or estranged children are essentially "forgotten" over time.

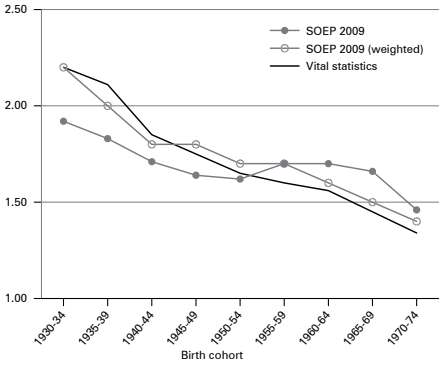
Another important finding from this investigation is that the weights do not affect the results very much. It is only for the SOEP – which is a highly stratified sample – that weighting affects the results in any sizeable manner. A possible reason for this could be that the weighting factors account for standard demographic characteristics (such as age, education, marital status and region), but they do not consider the number of children.

**Fig. 1:** Mean number of children by female birth cohorts, West Germany

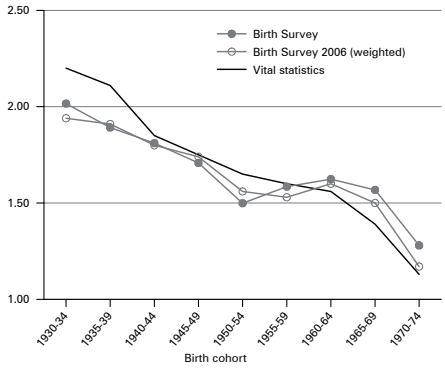
Panel 1: Mikrozensus 2008[1]



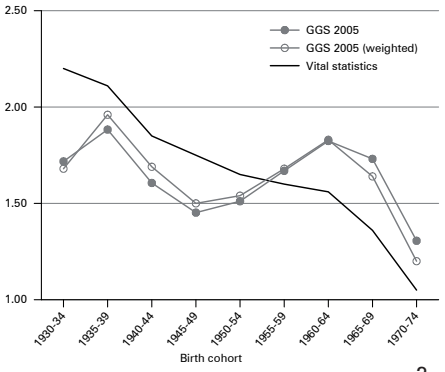

Panel 2: SOEP 2009[2]



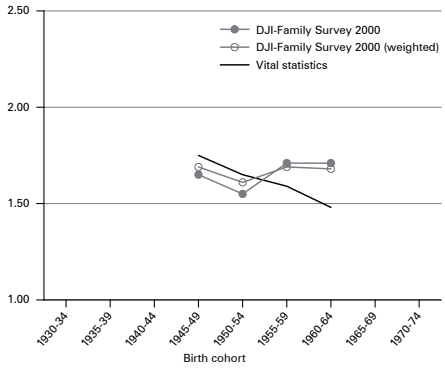

Panel 3: Birth Survey 2006[2]



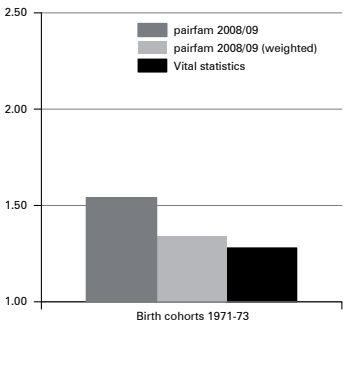

Panel 4: GGS 2005[2]




Panel 5: DJI-Family Survey 2000[2]




Panel 6: pairfam 2008/09, Cohorts 1971-73[2]




1 The sample comprises women who live in West Germany (excluding Berlin). The figure draws on the Mikrozensus data which used imputed fertility information.

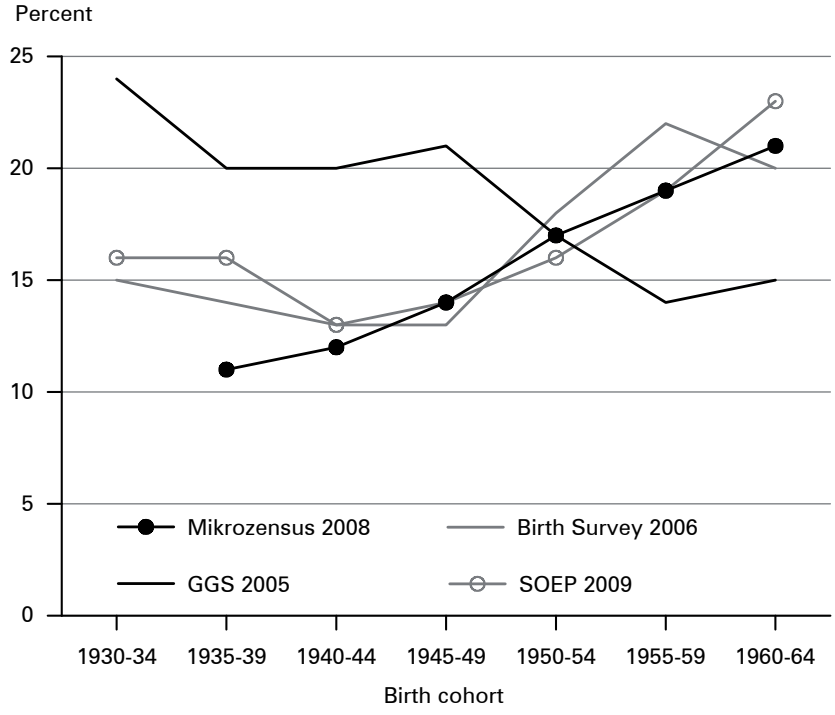
2 The sample comprises women who live in West Germany (including West Berlin).

Source: own calculations

Figure 2 compares the share of childless women by birth cohort. The DJI-Family Survey and pairfam have been excluded for this part of the analysis, as they do not allow for the analysis of long-term trends in childlessness.

Unfortunately, there is no benchmark for comparison (such as vital statistics) when evaluating childlessness trends. Nevertheless, it is disturbing to see that childlessness trends differ radically between the different sources of data. The Mikrozensus and SOEP suggest that childlessness has increased since the 1940s cohorts. The GGS suggests that it has declined, while the Birth Survey suggests that it has levelled off recently. If one disregards the GGS, one can presume that childlessness has increased since the 1950s cohorts. For the youngest cohorts, childlessness is around 20 % in all the surveys (apart from the GGS).

**Fig. 2:** Share of childless women by female birth cohorts, West Germany




Source: own calculations, weighted estimates

## 4 Austria

### 4.1 Vital statistics and census data

For Austria, data on live births are collected by the central statistical office, Statistics Austria, and have been published ever since 1871 for the present-day territory of Austria. Birth count data by the age of the mother, allowing the generation of

age-specific fertility rates, have been available since 1951. For the period 1951–1983 only the birth order within the current marriage was recorded, not the biological birth order. In 1983 the "Personenstandsgesetz" established a new birth registration system. Hence, the number of live births by biological order and the birth cohort of the mother are available since 1984, and this has made it possible to conduct order-specific fertility analyses (*HFD Austria* 2010).[10]

Fertility information is also available from census data. There have been three censuses that have contained fertility information: 1981 (May 12), 1991 (May 15), and 2001 (May 15). These included a question on the number of children ever born which was asked to all women who were older than 15. Thus retrospective information on cohort fertility for women born after 1882 is available. Unfortunately, there are some discrepancies between the censuses. The 1981 census show a significantly higher proportion of childless women who are past their reproductive age (by 2-6 percentage points for women born between 1900 and 1930) than was recorded in the 1991 and 2001 censuses (Fig. 3). This could partly be attributed to a change in the questionnaire. The slightly higher mortality of older childless women cannot account for such a large difference (*Prskawetz et al.* 2008: 299), nor is migration a possible explanatory factor for this age group.

Another country-specific data feature for monitoring fertility trends in Austria is the "Geburtenbarometer".[11] This project, launched in 2005 by the Vienna Institute of Demography (VID), provides continuous period fertility rates on a monthly basis. The advanced analysis of monthly birth rates is useful for studying short-term variations in fertility trends. In addition, the Geburtenbarometer publishes the „PAP" (period average parity), which is a period fertility measure that is less distorted by tempo effects than this is the case for the conventional TFR (*Sobotka et al*. 2005; *Zeman et al.* 2011)

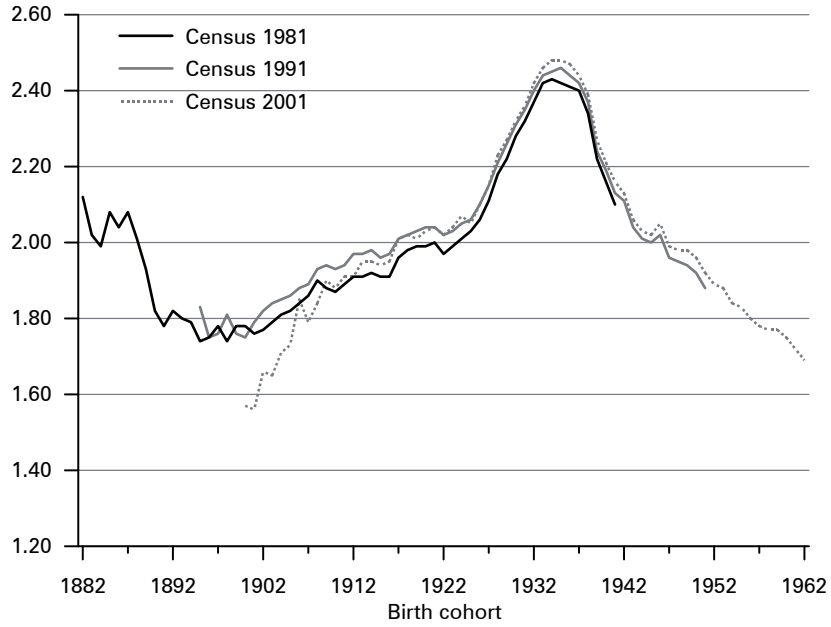
In 2010-2011 the "Geburtenbarometer" was refined further: separate fertility indicators were calculated for Vienna and the rest of Austria. The "Geburtenbarometer Wien" shows not only yearly indicators for 1984-2010 and quarterly indicators for 2002-2010, but also compares fertility in Vienna with other provinces, and analyses the fertility of women born outside Austria and their contribution to the fertility levels in Vienna (*Zeman et al.* 2011).

[10] Modelling of age and order-specific data for the period 1952-1983 has been carried out by *Anna Šťastná* and *Tomáš Sobotka* based on census data. The data are available by personal correspondence to the authors. They will also be made available in the Human Fertility Collection of the Max Planck Institute for Demographic Research and Vienna Institute of Demography in the future.

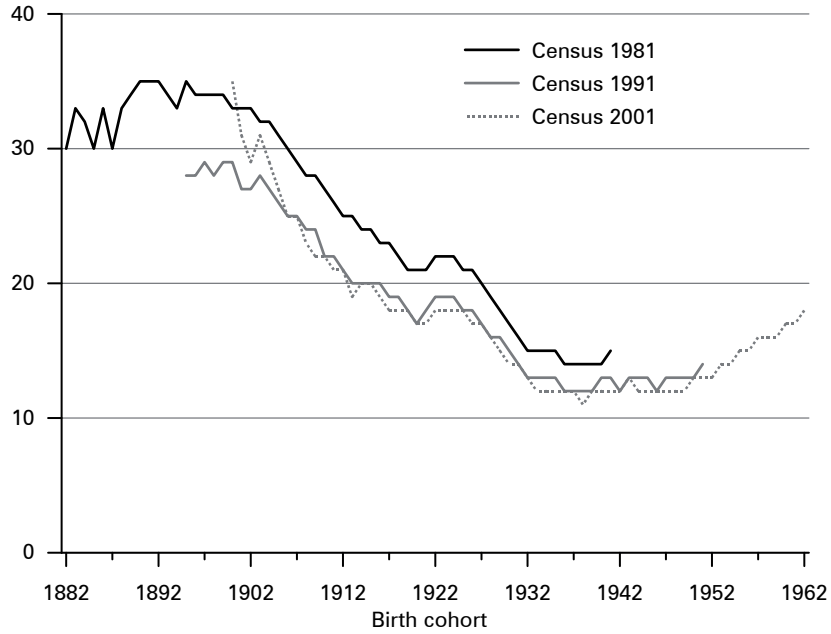
[11] www.oeaw.ac.at/vid/barometer

**Fig. 3:** Mean number of children and childlessness by cohort, Austrian censuses

Panel 1: Mean number of children




Panel 2: Percent childless




Source: Census 1981/1991/2001, Statistik Austria

## 4.2 Survey data

Austria has undertaken several social surveys that allow us to analyse how socio-economic and cultural factors determine fertility choices (see Table 2). The *Fertility and Family Survey* (FFS) for Austria was conducted in 1995/1996 by Statistics Austria and coordinated by the Austrian Institute for Family Studies (*FFS* 1996). It surveyed detailed fertility and family histories, fertility intentions, life biographies, contraceptive use and other socio-economic information from 4,581 female and 1,539 male respondents, with an overall response rate of 72 %. The age range of the respondents was 20 to 54 years at the time of the interview, which corresponds to the birth cohorts 1941-1976. The successor study, the *Generations and Gender Survey* (GGS), was conducted in 2008/2009. A total of 3,001 females and 1,999 males were surveyed, with a response rate of 61 %. One shortcoming is the rather narrow age range of 18 to 45, which is a problem for investigating long term trends and analysing cohort change.

Since 1967, Austria has been conducting a Mikrozensus which covers 0.7 % of the population in Austria. As participation in this survey is compulsory, the level of non-response is very low. A special module on fertility was included in 1986, 1991, 1996, 2001 and 2006. This module contained questions on the number of children ever born as well as on fertility intentions. In the 1976 and 1981 similar questions had been included, but they had been given to married women only.

Austria also participated in the European Social Survey (ESS). Like in Germany and Switzerland, the EES included a question on fertility in its wave 3.

**Tab. 2:** Selected social surveys in Austria

| Survey | Year | Sample | | Age |
|---|---|---|---|---|
| | | Females | Males | Range |
| Fertility and Family Survey (FFS) | 1995/96 | 4581 | 1539 | 20-54 |
| Gender and Generations Surveys (GGS) | 2008/09 | 3001 | 1999 | 18-45 |
| Mikrozensus (latest wave) | 2006/Q4 | 6135 | – | 20-60 |
| European Social Survey – wave 3 | 2007 | 1287 | 1118 | 15+ |

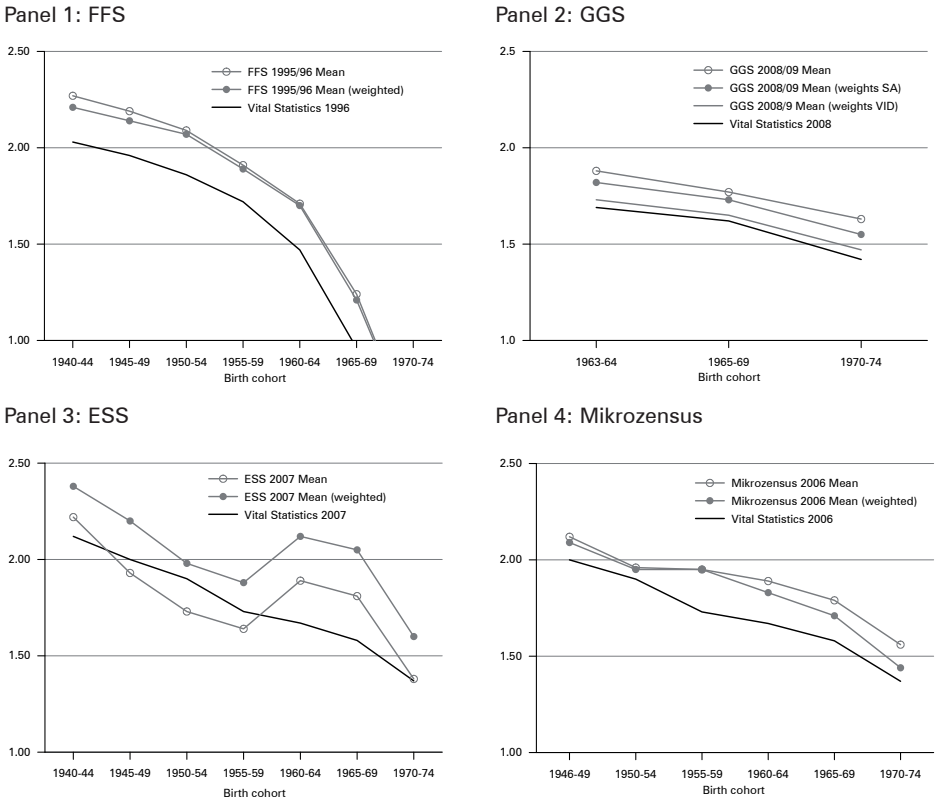
Note: The case number for the Mikrozensus only refer to the fourth quarter of the year 2006, because only this data will be used fort he subsequent analyses.

Source: own design

## 4.3 Comparison of fertility estimates from various sources

The following section compares fertility measures across different surveys. For this investigation, we have looked at data from the FFS, GGS, ESS and the Mikrozensus of 2006. Figure 4 displays the mean number of children from the different surveys. A comparison with vital statistics shows that the FFS overestimates fertility (Panel 1). The same conclusion holds true for the GGS (Panel 2).

**Fig. 4:** Mean number of children by female birth cohorts, Austria



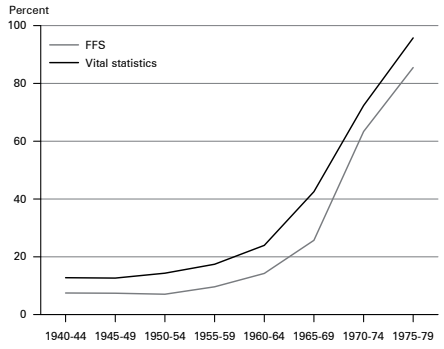

Source: own calculations

The "fertility bias" might be expected to be more pronounced in family surveys but less so in "all-purpose surveys". This can be investigated by looking at the ESS and the Mikrozensus (Panel 3 and 4). The figures for the ESS show a similar bias of overestimation of fertility levels as already seen in the FFS, particularly for younger cohorts. For the Mikrozensus, the pattern is less clear. Our results show that for cohorts of 1970 and older the number of children is slightly overestimated. Comparing the absolute deviations between indicators based on surveys and vital statistics, the Mikrozensus, FFS and GGS provide similar results.

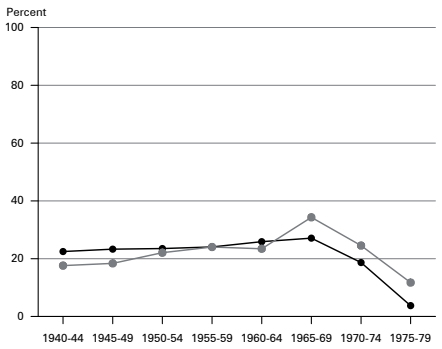
A more detailed inspection of the parity structure of the FFS data proves that most of the discrepancies in the mean number of children are driven by the fact that childless women have been under-sampled, while two-child mothers have been over-sampled (Fig. 5). Older women with one child are also underrepresented. Oversampling of mothers with one child as well as two children is very pronounced for the cohorts born around 1965. The younger the cohort, the greater the level of overrepresentation; this especially applies to younger one-child mothers. The possible reason for this might lie in the fact that mothers with newborn children are probably

**Fig. 5:** Parity distribution by cohorts; Fertility and Family Survey Austria (wave 1995/1996, weighted)

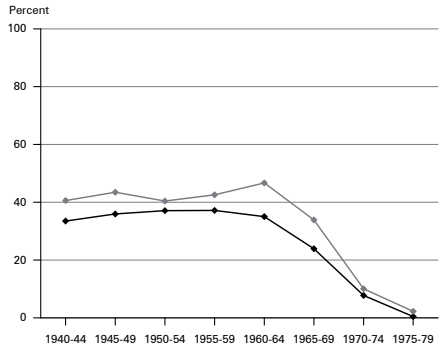
Panel 1: Childless women



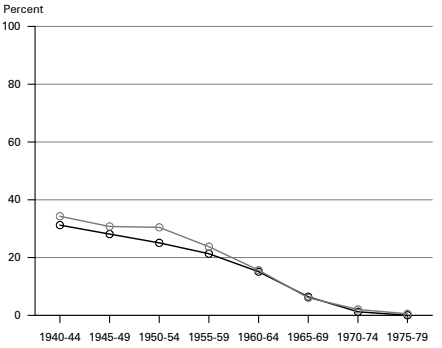

Panel 2: Women with 1 child




Panel 3: Women with 2 children




Panel 4: Women with 3 or more children




Source: FFS 1996, own calculations

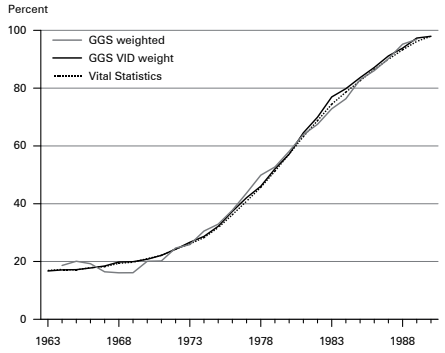
easier to access and interview than other women, because they spend more time at home where interviewers can reach them. The most common problem therefore is with under-representation of childless women (and over-representation of women with more children), resulting in the overestimation of the mean number of children per woman. This is in line with the experience from other FFS countries discussed by *Festy* and *Prioux* (2002).

### *Special Weights for the Austrian GGS*

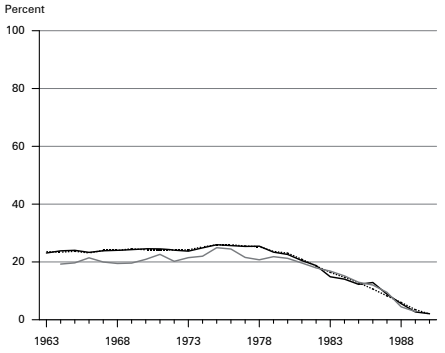
Prior analysis have shown a systematic bias in most of the data. This can be cured only partially by using weights. The reason is that the weights usually do not consider information on the number of children. Against this background, the VID team has generated a specific weighting factor for the GGS data that is particularly designed to account for the fertility bias. The special "VID weight" takes into account

**Fig. 6:** Parity distribution by cohort, using different weights; GGS for Austria (2008/2009)

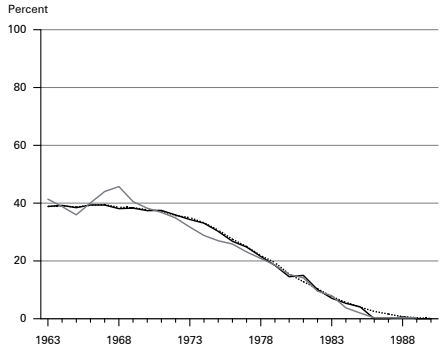
Panel 1: Childless women



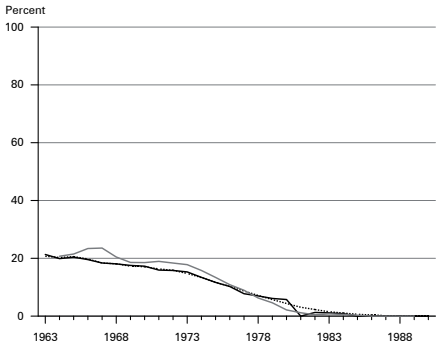

Panel 2: Women with 1 child




Panel 3: Women with 2 children




Panel 4: Women with 3 or more children




Source: GGS 2008/09, own calculations

the specific cohort-parity distribution. As a benchmark, the data from the Geburtenbarometer from 2008 are used (see *Buber* 2010 for a more detailed explanation). By applying the VID weights that adjust (in addition to age, sex, employment status, country of birth and living arrangements) also for the parity of female respondents, the discrepancies are minimised, and the results then do not differ from the vital statistics, as shown in Figure 5.

## 5 Switzerland

### 5.1 Vital statistics and census data

The vital statistics for Switzerland are collected and disseminated by the Swiss Federal Statistical Office (SFSO) in Neuchâtel, which was founded in 1860. Historical vital

statistics data for Switzerland were compiled by *Calot et al.* (1998). The publication (released with a data CD) includes several indicators: the total number of live births since 1801 – by month of birth since 1871 – and daily numbers since 1926. More detailed records of births by age of mother are available for the period 1944-1985. The data also include population counts by age and gender for 1861-1997. Data for the most recent years are available in the Human Fertility Database (*HFD Switzerland* 2010). Birth registration data since 1969 are available in electronic form from the SFSO[12], as are statistics of the mid-year population by age.

Prior to 1998, birth order was registered as order in the current marriage (also taking into account those children who were "legitimised" through marriage), with a separate category for extra-marital births. As the proportion of births outside marriage has increased, together with more complex partnership histories (*Rossier/ Le Goff* 2005), there has been an increasing demand for collecting biological birth order. This information started to be collected in 1998, although at first a significant proportion of births were still being recorded as unknown order; it is only from 2006 that the information on biological birth order is comprehensive and has been officially available. To close the gap in order-specific birth information, *Burkimsher* (2011) has estimated the number of births by order and age for the period 1969-2004 by drawing on the distribution of births from the years 1998-2008.[13]

In 2001 there was a change in the registration of births within Switzerland pertaining to the residence status of the parents. After 2000 some temporary residents, such as asylum seekers, were no longer included in the vital statistic totals: this caused a decrease in the total number of births registered, and hence a "blip" in the TFR for 2001 compared to 2000.

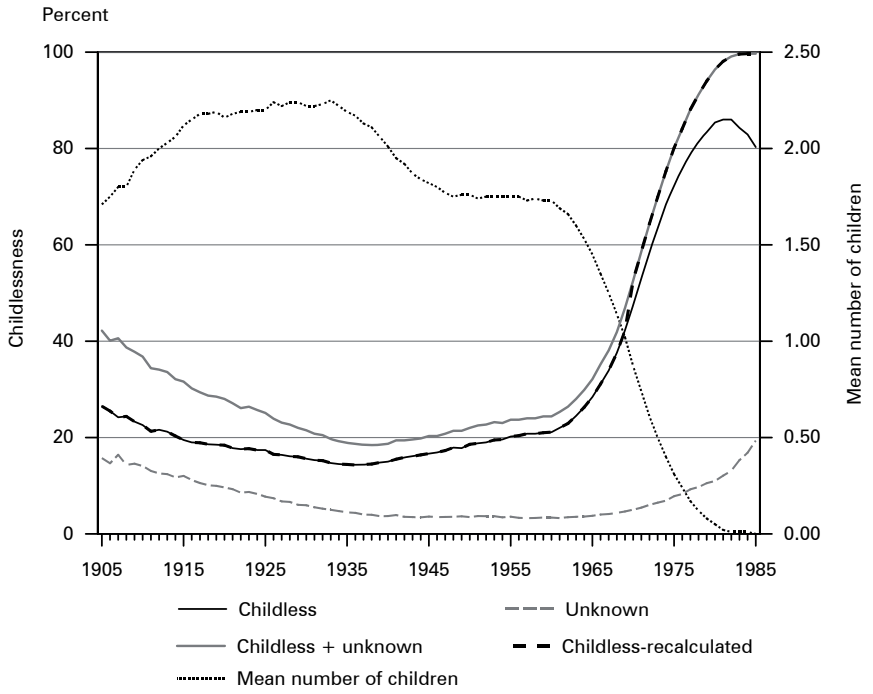
The Swiss Census has been carried out every ten years from 1860 up to 2000, with the exception of 1888 and 1941 (*Glei* 2008). However, only the census in 2000 (as recorded on 5 December 2000) included a question on fertility. All respondents (both male and female) were requested to report the number of (biological) children they have ever had (regardless of civil status). The data may be analysed by gender, by education, and by origin (native/migrant population), as well as by any other variable included in the census, such as household characteristics, nationality, religious affiliation (but not practice), etc. The population included in the census is the resident population and includes temporary residents; however, for the registration of births only permanent residents are included.

In the Swiss census 2000, a significant share (5.9 %) of the women failed to declare their number of children (*HFD Switzerland* 2010). There is also a significant difference in the proportion of women of foreign nationality who did not declare how many children they have had compared to Swiss women (2-6 % for Swiss women born between 1930 and 1975, compared to 6-11 % for the same cohorts of foreign

[12] BEVNAT database – Statistik der natürlichen Bevölkerungsbewegung http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/06/blank/data/01.html

[13] The data are available in the Human Fertility Collection of the Max Planck Institute for Demographic Research and Vienna Institute of Demography.

**Fig. 7:** Proportion of childless women and those with an unknown number of children, and the mean number of children by cohort, census 2000

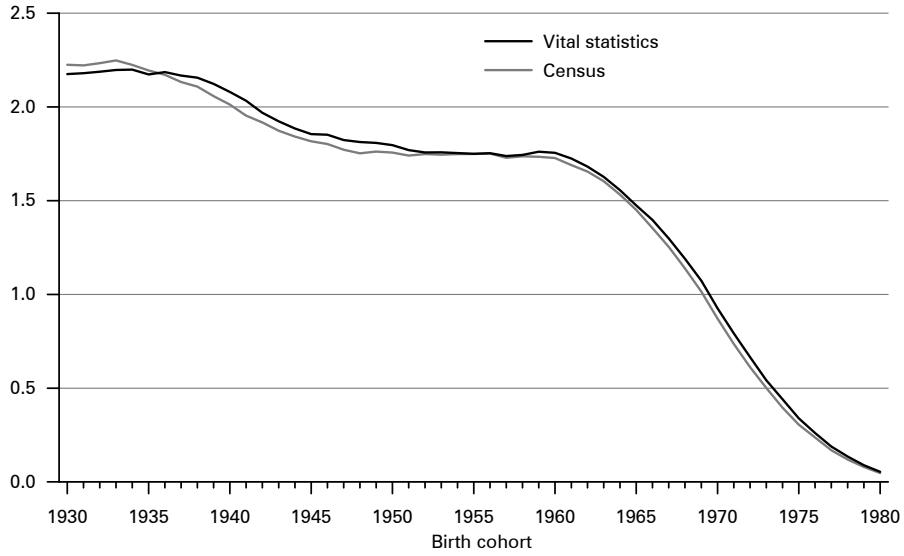



Source: Census 2000, SFSO, own estimates

women). The number of women with an undeclared number of children varies with age, and is especially high amongst very young and very old women. We suspect that most of the young women of unknown parity were in fact childless. To deal with this issue, we applied the following logic: for women up to 30, we consider those with an undeclared number of children to be childless, whereas after age 30 we consider only women who stated they had no children as being childless (dashed black line in Fig. 7), and proportionally redistribute the women of unknown parity. We therefore probably overestimate to some extent the proportion of young women who are childless.

In Figure 8 cohort fertility derived from birth registration data and from the census 2000 are compared. The figure shows a remarkable level of agreement. The reason why the agreement is, however, not perfect is because the structure of the population changed quite dramatically between the period when these cohorts were in their main reproductive period (1950s-1990s) and 2000, when the census was taken: there had been large net immigration flows in that period. For example, the 1960 cohort of women grew from about 47,000 in 1980, when they were aged around 20, to 58,000 in 2000, an increase of 23 %. More recent cohorts have expanded to an even greater extent: for example, the 1975 cohort grew by 42 % between 1990 (the start of their potential reproductive life) and 2009. Because immigrants have significantly

**Fig. 8:** Mean number of children in vital statistics and Swiss census 2000




Source: Vital statistics, Census 2000, SFSO

different fertility patterns than Swiss natives, this will cause differences between fertility statistics derived from birth registration and those from subsequent censuses and sample surveys.

## 5.2 Survey data

The main survey data set specifically designed to focus on the fertility history of women and men in Switzerland was the 1994/1995 *Fertility and Family Survey*. A number of other social surveys that included a question on number of children have also been carried out in Switzerland (for an overview, see Table 3).

Although the information from the FFS is now quite outdated, this is the best information on many fertility questions and attitudes that is available. The Swiss Federal Statistical Office plans to carry out a Family and Generations Survey in 2013. However, its scope will be more limited than that of the Generations and Gender Survey.

The *Swiss Household Panel* (SHP) started in 1999, with consecutive waves each year thereafter. It contains a wide range of questions on social and economic issues and on fertility intentions. The principal aim of the SHP is to observe social change, in particular the dynamics of changing living conditions of the population.

The European Social Survey (ESS) is also available for Switzerland. As in Austria and Germany, it included a question on fertility in its wave 3

**Tab. 3:** Selected social science surveys in Switzerland

| Survey | Year | Sample | | Age Range |
|---|---|---|---|---|
| | | Females | Males | |
| Fertility and Family Survey | 1994/1995 | 3,881 | 2,083 | 20-49 |
| Swiss Household Panel | wave 2000 | 3,967 | 2,901 | 3-92 |
| European Social Survey wave 3 | 2006/2007 | 988 | 815 | 15+ |

Source: own design

### 5.3 Comparison of fertility estimates from different sources

In the following, we evaluate three surveys which have included fertility questions, namely the FFS, SHP (wave 2000) and ESS (wave 3). Figure 9 plots the mean number of children by female birth cohorts for these data. In contrast to the Austrian and the German data that broadly overestimate fertility for the younger cohorts, we do not find this pattern for the Swiss FFS (Panel 1). The commonly observed problem of overstating fertility in surveys apparently does not appear to be the case in the Swiss FFS. The summary indicators of fertility from the FFS sample seem to be in excellent agreement with those derived from vital statistics.

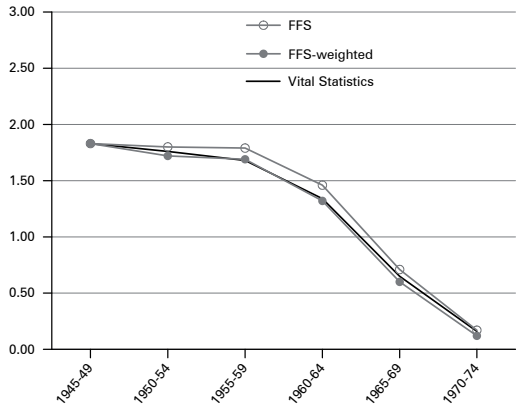
In the SHP, retrieving the number of children was not as straightforward as in the case of the FFS because, given the design of the household panel, we needed to associate own co-resident children to mothers based on household ID, then adding own children not living in the household. For the SHP, we find a similar pattern as in the German data. Fertility for the younger cohorts is overestimated, while it is underestimated for the older ones (Panel 2). For the ESS, the pattern is very irregular (Panel 3). Here, one must consider that this is a rather small sample with only about 80 respondents per cohort group.

We have investigated the parity distributions for the Swiss data only for the FFS and SHP, as the EES has a rather small sample for this part of the analysis. The parity composition derived from the FFS is displayed in Figure 10. As Swiss vital statistics do not provide any order-specific cohort data (yet), we used as benchmark estimates based on the census 2000 combined with vital statistics data generated by *Burkimsher* (2011). From the graphs it is apparent that there exists a bias which is concealed when one uses summary measures such as the mean number of children: A slight over-sampling of women with 1 and 2 children is counterbalanced by under-sampling of women with 3 or more children.

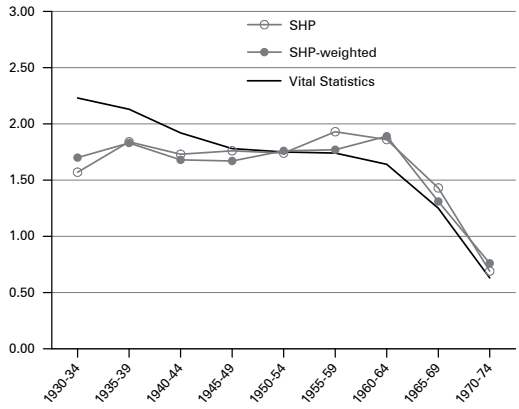
Regarding the Swiss Household Panel (SHP) we have chosen to use wave 2000 which allows direct comparison with the census 2000 data. In Figure 11 we observe that childless women have been over-sampled in general while women with three or more children have been under-sampled. Both mismatches are very pronounced for the older cohorts. The best agreement is for one-child mothers. Contrary to the more usual tendency to under-sample childless women in surveys, for the Swiss Household Panel the results show the opposite: under-estimation of the mean

**Fig. 9:** Mean number of children female birth cohorts, Switzerland

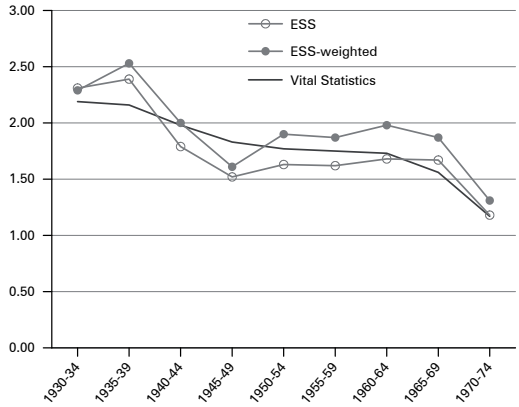
Panel 1: FFS 1994/1995




Panel 2: SHP 2000

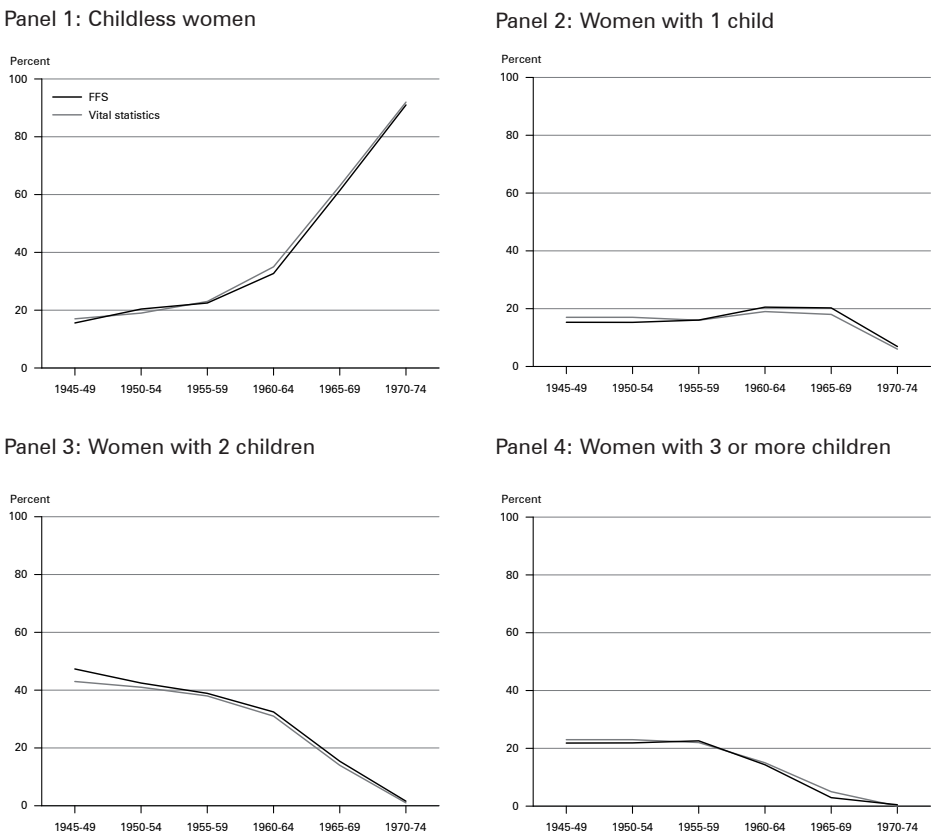



Panel 3: ESS 2006/2007




Source: own calculations

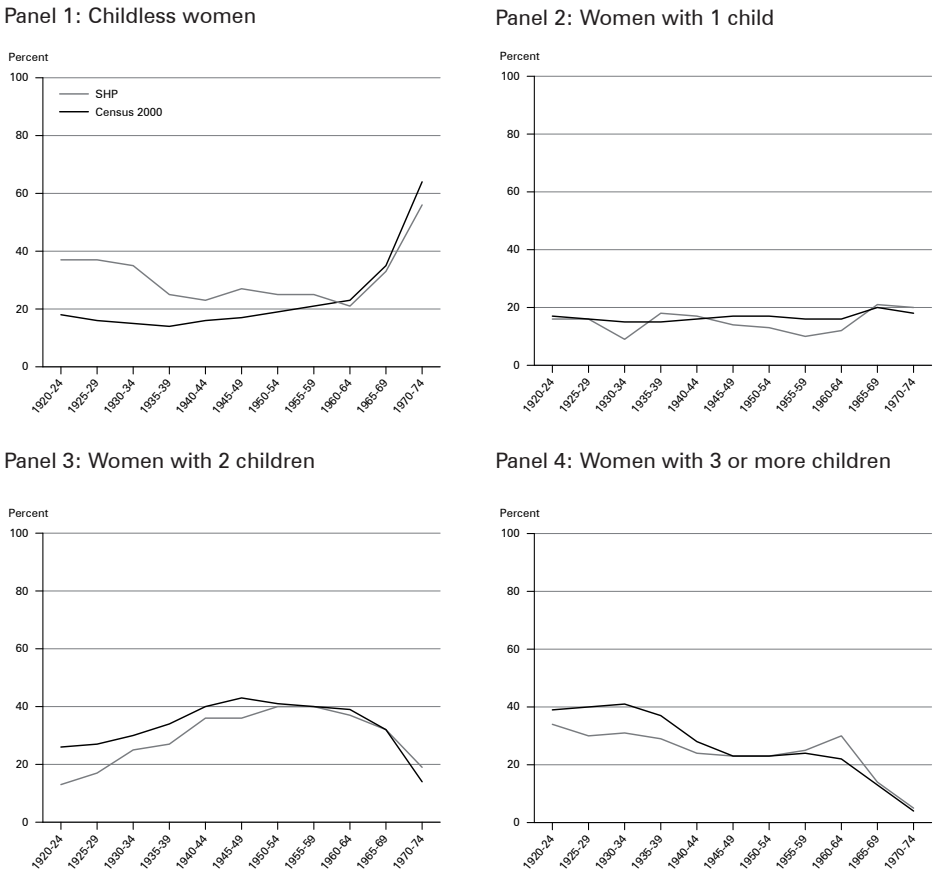
**Fig. 10:** Parity distribution by cohorts; Fertility and Family Survey (1994/1995)




Source: FFS Switzerland 1999, own weighted calculations

number of children and over-estimation of childlessness. However, for the youngest cohorts, the proportion of childless women followed the more usual pattern of being under-represented.

**Fig. 11:** Parity distribution cohorts; Swiss Household Panel (Wave 2000)




Source: SHP 2000, own weighted calculations

## 6 Conclusion

This paper had three objectives: firstly, to inform about the availability of order-specific fertility data in the vital statistics of Germany, Austria and Switzerland; secondly, to provide an overview of survey data that can be used to generate fertility indicators; and thirdly, to compare fertility estimates across surveys to evaluate the reliability of survey-based fertility indicators.

An overview of the data situation can be summarized as follows. The big strength of the *German situation* is the fact that several high quality panel studies, such as pairfam and the SOEP, are available to study fertility and family dynamics. Also the fertility information from German vital statistics has improved in recent years as order-specific birth information is now collected. Moreover, a question on the number of children has finally been included in the 2008 Mikrozensus. However,

one big weakness is the large item non-response for the fertility question in the Mikrozensus.

Our general assessment of the *Austrian situation* is that the quality of vital statistics is very high. In contrast to Germany, which only recently enhanced its vital statistics, Austria did so in 1984. Apart from the fertility data collected in the censuses of 1981, 1991 and 2001, the availability of large-scale survey data sets is limited. In regard to panel studies, the data situation in Austria differs substantially from Germany; there are no large panel studies that can be used for the analysis of fertility dynamics. The sample size in the main family survey, the Austrian GGS, is also rather small and the age range is limited which restricts the possibility of determining long term trends.

The *Swiss situation* is mixed. The availability of order-specific data from Swiss vital statistics is limited, as official order-specific fertility data are only available from 1998 onwards.The Swiss Household Panel survey includes fertility data; however, there are no comparable recent family surveys as in Germany or Austria. It is also unfortunate that the Swiss census only gathered fertility information in 2000.

Overall, the availability of survey data to conduct fertility analysis varies quite radically between the three countries under consideration. In order to assess the quality of fertility data in the different social science surveys, we compared fertility estimates of various types of data with information from the vital statistics. The key indicator we used for validation was the mean number of children. We also calculated order-specific indicators such as the proportion of childlessness by birth cohorts of women.

We assumed that a "family bias" tends to be inherent in social science surveys. The reason is that women with small children are usually easier to reach for interviewers than childless respondents or respondents with older children (*Festy/Prioux* 2002). Therefore, cohort trends in childlessness derived from surveys tend to be biased, because the fertility of younger cohorts is overstated. For family surveys one additionally needs to consider that respondents with young children are likely to be more interested in participating in the survey, which will create an additional bias.

Our investigation of data from German-speaking countries gives some support to this hypothesis, as we find a "family bias" in the Austrian FFS and ESS and the majority of the German surveys. Applying standard weights to the data did not cure much of the bias, which we attribute to the fact that these do not control for number of children (however VID weights of the Austrian GGS successfully corrected for the parity composition of women). It is also worth noting that the bias was particularly strong in the family surveys, but all-purpose surveys, such as the Swiss Household Panel and the Austrian and German Mikrozensus, did not suffer from it to the same extent. Thus we conclude that unit non-response is more selective in family surveys than in all-purpose surveys, as childless respondents might be less interested in participating in these types of surveys.

While unit non-response is an issue in social science surveys, selective item non-response turned out to be an important issue in the German Mikrozensus and in the Swiss census. In censuses respondents are obliged to participate by law,

which results in a low unit non-response. However, item non-response was high for the question on the number of children and it is considered probable that childless respondents were more likely than others to not answer this question. Given the major importance of the Mikrozensus, it seems highly desirable to make a stronger effort to obtain reliable fertility information. This would not only guarantee that we get trustworthy "structural indicators", it is also important for social science surveys which rely on the Mikrozensus to generate their weighting factors.

This paper has left several issues unresolved. We have compared survey data with vital statistics, but the effect of migration, which blurs the comparison, has only briefly been mentioned and has not been explored sufficiently. Fertility indicators derived from survey data, compared to those derived from vital statistics, must differ because they consider different populations, particularly for the older cohorts. On the one hand, surveys do not include respondents who have died or emigrated, and selection upon "survival" will bias any estimates of childlessness for the older cohorts. On the other hand, surveys do include respondents who have moved into the country. As young childless women are the most mobile ones, both nationally and internationally, accurate estimates of their numbers over time are difficult to collect even with compulsory registration. Full population registers that contain fertility as well as migration histories could be a remedy for this problem. The Austrian register-based census might be a first step in this direction. However, for Switzerland, and particularly for Germany, the future availability of this type of data is unlikely. Surveys that contain fertility and migration histories will remain the most realistic option for now. However, sampling mobile, young, childless women remains a challenge for survey analysis. Taking into account the effects of migration in fertility analysis is likely to be a growing challenge in the future for research based on survey data, as well as on vital statistics.

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