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The German Generations and Gender Survey: Some Critical Reflections on the Validity of Fertility Histories

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Abstract: This paper validates the fertility histories of the German Generations and Gender Survey (GGS). Focusing on the cohorts 1930-69 of West German women, the total number of children, the parity distribution and the parity progression ratios are compared to external sources. One major result from this validation is that the German GGS understates the fertility for the older cohorts and overstates it for the younger ones. We presume that two mechanisms are responsible for this pattern in the German GGS: On the one hand, children who have left parental home are underreported in the retrospective fertility histories. On the other hand, women with small children are easier to reach by the interviewer. These two mechanisms taken together produce too low numbers of children for the older and too high ones for the younger cohorts. Extending the validation to marital histories has revealed a similar bias. Our general conclusion from this investigation is that the German GGS may not be used for statistical analyses of cohort fertility and marriage trends. For subsequent surveys, we suggest integrating simple control questions in questionnaires with complex retrospective fertility and union histories.

Keywords: Fertility · Fertility history · Union history · Marriage · Data validation · Germany · West Germany · Generations and Gender Survey · GGS · Mikrozensus

1 Introduction

In recent years, fertility and family researchers have greatly profited from a growing availability of large-scale data sets. This is particularly true for Germany. With the Generations and Gender Survey (GGS), the Panel Study of Intimate Relationships (pairfam), the German Socio-Economic Panel (SOEP) and the National Educational Panel Study (NEPS), Germany will soon have four large panel data sets that can be used for the study of fertility and family dynamics. With growing data availability,

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it will also become easier to compare findings across the different surveys and to validate the quality of the survey data, i.e. by studying how stable empirical findings are across surveys.

This paper is mainly concerned with the validation of fertility histories. Birth histories are commonly regarded as hard facts that can be collected retrospectively without much decrement in the data quality. Even though children of unmarried men might be underreported (*Rendall et al.* 1999), the overwhelming majority of respondents will be happy to report whether they are mother or father of a child. Furthermore, the collection of fertility histories should not be subject to substantial recall errors which make the collection of employment or residential careers a cumbersome venture (*Beckett et al.* 2001). However, previous research has shown that fertility information derived from survey data might nevertheless be subject to various types of distortions (*Swicegood et al.* 1984; *Festy/Prioux* 2002; *Murphy* 2009; *Burkimsher* 2009; *Pötzsch* 2010; *Neels et al*. 2011; *Kreyenfeld et al.* 2012; *Ní Bhrolcháin et al.* 2011). Unit nonresponse is a particular issue for fertility researchers given that, in standard surveys, childless respondents are more difficult to reach than families with children (*Festy/Prioux* 2002: 23). Item nonresponse is a source of additional bias if certain subgroups of the population are reluctant to answer certain questions in a survey. For older cohorts, selection on survival might also create a problem. If fertility histories are not equally well collected across cohorts, surveys will not be able to reflect cohort change in behaviour in a satisfying manner. Since long-term behavioural changes are central themes to social science researchers, it seems, however, fundamental to answer the question how well standard surveys depict cohort changes in fertility behaviour.

This contribution tries to fill parts of this gap by validating fertility histories of the first wave of the German Generations and Gender Survey (GGS). The paper is structured as follows. Part 2 discusses possible sources of bias in cohort fertility estimates that are derived from retrospective surveys. Next follows the validation of the fertility histories of the German GGS (part 3). The following chapter speculates about possible sources of bias (part 4). In addition, results from the validation of union histories are displayed in this section to see if some possible bias in the union histories runs in a similar direction as in the fertility histories. Part 5 concludes our investigation.

2 Sources of bias in retrospective surveys

There are several merits in collecting retrospective data on fertility and union histories in social science surveys. With a retrospective survey that covers a sufficiently large age range, one is able to depict long-term historical changes in behaviour. A prospective survey would not only be more expensive, but would also suffer from serious attrition bias if a long historical time period was to be covered.

Moreover, the fact that retrospective data is “ready to use” relatively quickly after the survey, while it takes many years to build up a panel study, speaks for this type of data collection (*Beckett et al.* 2001: 594). For some research questions, a retrospective survey is furthermore the only tool to learn about long-term behavioural changes because, for previous decades, information on a specific behaviour (such as cohabitation patterns) cannot be generated based on other data sources. Taken these arguments together, it seems worthwhile to collect retrospective fertility and union histories not only for recent cohorts, but also for the older ones (*Cleland/ Verma* 1989: 762). In this spirit, the Generations and Gender Survey (GGS) has been designed to survey detailed fertility and union histories retrospectively and to cover the age range 18-79 years that enables researchers to depict changes in the demographic behaviour since the 1930s cohorts (*UNECE* 2005: 5).

However, the collection of retrospective histories may be subject to various kinds of distortions. In the GGS, the fertility and union histories of respondents who have given birth or started their unions 50 or more years prior to the survey are recorded. If events that are located in the distant past are not collected with the same precision as earlier events, the analyses will produce a misleading pattern on long-term demographic changes (*Murphy* 2009). There are several reasons why such a bias may exist:

One of the major concerns in this context is *recall bias* (*Gaskell et al.* 2000; *Beckett et al*. 2001: 594). Respondents may forget events that occurred in the distant past or they might give faulty reports because events may have been redefined based on the present circumstances. For biographical events, a source of error also occurs because respondents are unable to locate the event accurately in time. Past events may either be recalled as being closer to the date of interview than would be accurate, a phenomenon described as "telescoping", or they might be set further into the past by the respondent, such a case being labeled as "time expansion" (*Gaskell et al.* 2000; *Dex* 1995). The degree to which the collection of retrospective histories suffers from a recall bias depends on the type of history that is being collected. Union histories may suffer from recall bias because unions may be erased from the memory if the union had ended in separation (*Mitchell* 2010). Cohabitation histories may be difficult to collect because memory has dimmed the dates when one had moved in with a partner. Respondents might also deliberately report wrong dates if, for example, they are concerned that cohabitation before childbirth is considered as a socially undesirable event (*Teitler et al.* 2006: 469). More "salient" and socially acceptable events like marriage might be easier to collect retrospectively. Correctness of dates might be easier to achieve when the dates of the event are "rehearsed" because anniversaries are celebrated or dates need to be reported in the official registration system (*Beckett et al*. 2001: 595). Fertility histories may neither suffer from great recall bias given that the birth of a child is an event that should remain "salient" in the memory of the respondent as its date is regularly brought into memory. However, in an evaluation of the fertility histories of the British General Household Survey (GHS), *Murphy* (2009: 130) still speculates that children might be "forgotten" in surveys. Reduced social contact and intra-family conflict might be reasons for estrangement of mothers and their children resulting in some wrong declaration of the number of children. If estranged, deceased or emigrated children are not reported by elderly respondents, this may muddle the analyses of long-term demographic patterns (*Ní Bhrolcháin et al.* 2011).

Nonresponse is another classical source of bias in surveys (*Groves et al.* 2009). Respondents may not be reached by the interviewer or may object to participating in a survey (unit nonresponse). Even if they participate, respondents may still refuse to answer particular questions (item nonresponse). The latter has been shown to be the case for the German Mikrozensus. Respondents are requested by law to participate in this study, but the answer to the question on the number of children integrated in the 2008 version of the survey was not obligatory. This resulted into an unusually high share of 12 % item nonresponse on the fertility question. Evaluations against information on the number of children from the household grid showed that it had been childless respondents in particular who had refused to provide information on the number of their children (*Pötzsch* 2010). Item nonresponse is a critical issue for compulsory surveys like the German Mikrozensus as long as they also include non-obligatory questions. But social science surveys are rather known to suffer from unit nonresponse as certain subgroups of the population, such as young childless men, are difficult to catch in surveys, while others, such as mothers with their small children, are overrepresented (*Rendall et al.* 1999; *Groves et al.* 2009: 210). An evaluation of the Fertility and Family Surveys shows unusually high fertility rates for the younger cohorts, which has been explained by a "family bias", i.e. the fact that women who have young children are easier to reach by the interviewers (*Festy/Prioux* 2002). The particular topic of surveys creates an additional bias as respondents with children are more inclined to participate in family studies than their childless counterparts. Weighting should in principle cure the distortion caused by such selective unit nonresponse. However, it has been shown that weighting is rarely a remedy to the problem because, in general, fertility information is not accounted for when sample weights are designed (*Kreyenfeld et al*. 2012).

Bias is also related to the *wording of the questions* in the survey (*Schuman/Presser* 1996). Soft indicators, such as attitudes and opinions, are widely believed to be more sensitive to the design of the question than this is the case with factual information. Furthermore, for some demographic events, it may be difficult to find valid operational definitions because, like it is the case for cohabitation, the date when a partner moves in may be rather fluid in some instances (*Manning/Smock* 2005; *Teitler et al.* 2006). However, there is consensus that the birth of a child is a hard fact in a person's life so that the wording and phrasing of the question should not affect the answering pattern of the respondent.[1]

The *placement of the question* constitutes another, more serious issue. Fertility histories may be fully recorded at "one shot". For example, this strategy had been chosen for the Fertility and Family Survey (FFS) where the respondents were asked to give the dates of birth of all children in the fertility section of the questionnaire. Another approach is to survey information on all children who co-reside with the respondent in a household grid. Then, in a later section of the questionnaire, in-

1 The definition of still and live births may create a problem in social science surveys. However, this aspect should be more important for the collection of fertility histories in countries with higher rates of infant mortality and a high prevalence of still births (*Cleland/Verma* 1989: 763).

formation on non-resident children is gathered. The advantage of this procedure is that more specific questions concerning either the resident or the non-resident children can be grouped around each of the two “types of children”. But it also leads to the disadvantage that surveying the information independently from each other may give room to incomplete reporting. This is especially a critical issue for cohort analyses of fertility, as the children of the older cohorts have mostly left parental home and will only be collected in later parts of the questionnaire where respondents’ attentiveness may have declined.

In a similar vein, *Ní Bhrolcháin et al.* (2011: 314) concluded in their evaluation of the fertility histories of the British General Household Survey (GHS) that “respondent fatigue combined with a learning effect” produced considerable bias. Respondents had learnt that a “no” to the filter question about own children shortened the interview and avoided further longer parts requiring detailed information on a multitude of questions. Moreover, it was shown that misreporting of childlessness was much more frequent among the respondents who used computer-assisted self-interviewing (CASI). A first suspicion that, mainly for the older respondents, some lack of computer literacy was the source of error, however, could be refuted as the quality of response of other parts of the survey like the partnership histories was not affected to the same extent. Adding up to the argument about respondent’s fatigue in the British case are the facts that the number of questions before the part on the fertility history had increased considerably in the GHS in the course of the 1990s and that the fertility histories had been placed at the end of the “Family Information” section. Consequently, the respondents might have developed the strategy to shorten the interview via incorrect answers *(Ní Bhrolcháin et al.* 2011: 314-315).

Another source of distortion in a retrospective survey derives from the fact that, generally, only the *resident population* is included into a survey. If one tries to reconstruct the fertility and unions histories based on a retrospective survey, one ultimately suffers from the fact that the study population has changed over time due to migration and mortality. This aspect is rarely discussed in the methodological literature, probably because the cause of distortion is more of demographic than of methodological nature. In a recent study by *Burkimsher* (2011) on Switzerland, it is, however, shown that fertility estimates from census data differ from estimates based on vital registration data, what the author largely attributes to migration flows.

Taken together, recall bias, nonresponse, question placement as well as selective migration and mortality influence the quality of fertility information obtained from retrospective surveys. Since older cohorts may be affected overproportionally by these aspects, a key question is whether retrospective surveys are able to adequately depict long-term demographic changes. In the following, the fertility histories of the German Generations and Gender Survey are evaluated, focusing on the question which factors may have biased the results on long-term fertility change in Germany.

3 Data and method

3.1 Data

The German Generations and Gender Survey was conducted as part of the *Generations and Gender Programme* (GGP) that has been conceptualised by a consortium of institutions coordinated by the *Population Unit of the United Nations Economic Commission for Europe* (UNECE). The GGP is currently coordinated by the *Netherlands Interdisciplinary Demographic Institute* (NIDI). The data collection was directed at the demographic and social behaviour in developed countries and mainly in Europe (*Vikat et al*. 2007). The aim of the project was to initiate analyses on the developments and the determinants of the diverse demographic and social phenomena related to family formation processes, demographic change, intergenerational relationships and relationships between partners. One of the main focuses within the first wave was to capture the complete fertility and partnership histories of the respondents in a detailed way.[2]

Our investigation is based on the German GGS.[3] The first wave of the German GGS was carried out between February and May 2005. Respondents aged 18-79 were included in the survey. The survey agency *TNS Infratest Sozialforschung* conducted the survey applying a random route design to draw the sample. A pre-test with 115 respondents had been conducted which apparently did not show any peculiarities. In the final study, 10,017 valid interviews were carried out. A response rate of 55.3 % has been reported which seems to be in the usual range of social science surveys (*Diekmann* 2002: 189). Interviews were realised using computer-assisted personal interviewing (CAPI). Sampling weights, which account for the fact that certain subpopulations are underrepresented in the GGS, were provided by the survey agency.[4]

For our validation of the fertility histories of the German GGS, we limit the analysis to women born between 1930 and 1969. These cohorts are generally past their reproductive ages so that the estimates reflect completed fertility. However, the youngest cohort category (cohorts 1965-69) is still of childbearing age in 2005 and the results from these cohorts may be carefully interpreted. The investigation is furthermore limited to the western states of Germany (excluding Berlin). We do not consider the eastern states of Germany because the demographic situation in eastern Germany is still very different from the one in the western areas. Respondents are defined as West Germans depending on the region they live in at the time of interview.[5] Obviously, this classification does not account for the migration of East

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2 http://www.ggp-i.org/.

3 UN-Version labeled ‘GGS_Wave1_Germany_V.3.0.dta’ (downloaded February, 2nd 2012).

4 Documentation of the German GGS is available in German (*Ruckdeschel et al.* 2006) as well as in English (*Ruckdeschel et al.* n.d.).

5 In the following text, we use the expressions “West German” and “West Germany” when referring to both, the former West Germany before the unification in 1990 or the western parts of Germany after 1990.

Germans to West Germany (and vice versa). Despite these limitations, we still find it appropriate enough to use this sample selection for our investigation of fertility behaviour in West Germany. After selecting women of the cohorts 1930-69 who are resident in the western regions of Germany, the sample size is reduced from the total 10,017 to 2,851 respondents. Deleting 66 cases with missing fertility information from the sample leaves us with a total of 2,785 cases for our investigation.

3.2 Variables of interest and method

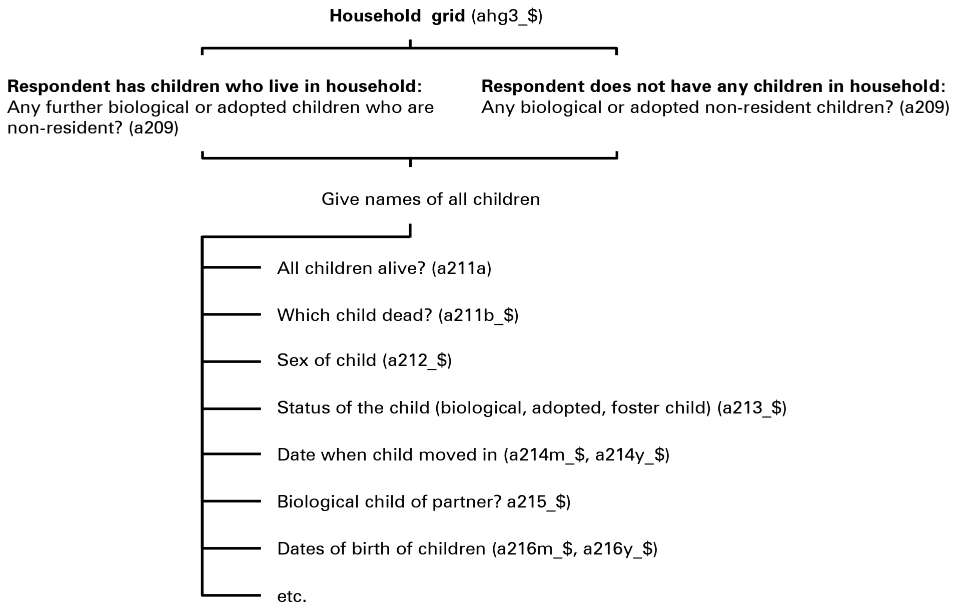
Within the GGS questionnaire, the fertility histories of the respondents are recorded in two different sections. In a first section, the respondent is asked to give information on all persons living in her or his household, such as year and month of birth of the household members and the relationship of the household members to the respondent. For the children in the household, a distinction between biological children with the current partner, biological children with a former partner, stepchildren, adopted children and foster children is made. From this information, one can derive the number of biological and non-biological children who still live in the same household unit as the respondent. In a second section of the questionnaire, the respondent is asked to provide the name of any biological or adopted children who do not live in the same household (see Fig. 1). A question on whether all children are alive follows, as well as another one that asks the respondent to report all dead children. In the subsequent questions, the respondent has to provide the following information for each child: the sex, whether it is a biological, adopted or a foster child, the dates when the child moved in, whether the child is the biological child of the partner and, for deceased children, the dates of death. For children below age 14, questions on parental leave and childcare follow. For older children, the dates of leaving parental home and the distance between the places of residence of the children and the respondent are recorded. The section finally concludes with a question on the relationship quality of the child and the respondent. The subsequent section of the questionnaire addresses then non-resident stepchildren.

In order to generate the total number of children, we have summed up the number of biological resident and non-resident children of the female respondent (see STATA-Code in the Appendix for details). There were several subtleties to be considered when we generated the total number of children.

Firstly, a decision needed to be taken how to treat step-, foster and adopted children. As we mostly validate our data against vital statistics (see Section 3.3), we only considered biological children. Women with non-biological children stay in the sample, but only the biological children are used to generate the total number of children. If, for example, a woman reports to have a biological and an adopted child, we only take her biological child into consideration.

Secondly, a decision needed to be made how to treat missing information. We identified three sources of nonresponse. Respondents may have given incomplete information in the household grid. This applies to 5 cases in our sample of West

Fig. 1: Flow chart on how children are surveyed in the German Generations and Gender Survey (GGS)



Source: own design

German women of the cohorts 1930-69.[6] Furthermore, the respondent may have refused to report if she has non-resident children.[7] This applies to another 4 cases. Finally, there are further 57 cases for which the respondent has reported that she has non-resident children, but failed to provide any further information on the children.

Altogether, there are 66 cases with incomplete information on the number of children. These cases have been deleted from the analysis. By applying this procedure, some respondents with children have obviously been omitted from the analysis, as 57 of the deleted 66 cases reported having non-resident children, but did not provide further information on these children. To what extent this aspect affects the results will also be addressed in the subsequent investigation.

3.3 Data for external validation

For the validation of the data against external data sources, we generate three types of indicators: (1) the total number of children, (2) the parity distribution and (3) the

6 ahg3_$ had been set to either ".a" (no response/not applicable) or ".c" (does not know).
7 a209 had been set to either ".a" (no response/not applicable) or ".c" (does not know).

parity progression ratios by birth cohorts of women. For all three measures, we have generated 95-percent confidence intervals around the estimates. In order to guarantee sufficiently large sample sizes per cohort group of women, we have grouped the different cohorts into five-year intervals.

In a first step, the cohort fertility estimates generated from German vital statistics are used to check the total number of children (*HFD* 2011). It should be noted that the cohort data from the vital statistics are generated from period data that are “stacked together” in a way that they build a real cohort. This has some implications for the definition of the individual’s regional affiliation. While, in the GGS data, a West German is a person living in West Germany at the time of interview, the data from the vital statistics give the fertility pattern of a “synthetic person” who has lived his or her whole life in West Germany. Moreover, it is a bit cumbersome to match cohorts precisely across these two types of data. For the GGS, it is necessary to group several cohorts into one category to assure a sufficiently large sample size. In contrast, for the vital statistics, we only have the average number of children for single cohorts at our disposal. In order to make both data sources comparable, we have used the cohort from the vital statistics which falls in the middle of the cohort grouping of the GGS. In general, these aspects need to be kept in mind, but in principle, vital statistics should be a reliable source for external validation of the fertility estimates from the GGS.

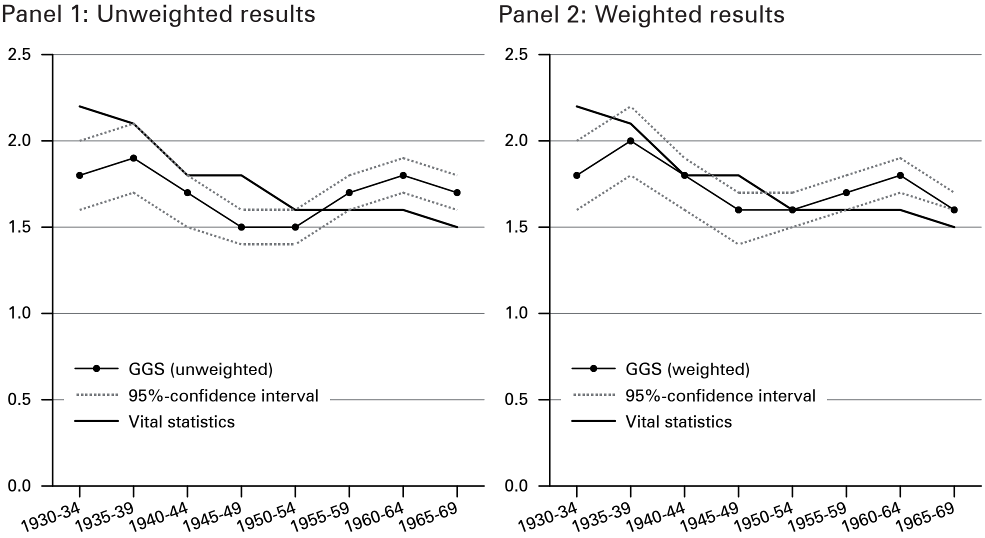
Unfortunately, it is not possible to validate the parity distribution against vital statistics data. To realise this validation, we have drawn on data from the German Mikrozensus that was conducted in 2008 and was the first Mikrozensus that surveyed the number of biological children per woman. The Mikrozensus data suffers from high item nonresponse for the question that measures the number of children and it thus seems questionable to use the data as a reliable external source. However, the German Statistical Office has developed an imputation scheme to correct for the selective item nonresponse (*Statistisches Bundesamt* 2009). We are unable to fully verify if the imputed Mikrozensus data provide reliable estimates on the parity distribution. Yet, validation against vital statistics data has shown that the imputation scheme provides reasonable results for the total number of children. Furthermore, estimates on childlessness from the imputed Mikrozensus data are in line with estimates from other social science surveys (*Kreyenfeld et al.* 2012). Judged from this evidence, the parity distributions from the Mikrozensus 2008 are probably the most reliable ones that currently exist for Germany.

3.4 Validation of the fertility histories of the German GGS

3.4.1 Total number of children

Figure 2 displays the comparison of the total number of children as it was generated from the GGS data and from the German vital statistics. As can be depicted from the figure, the German vital statistics suggest that the total number of children has

Fig. 2: Average number of children of West German women born 1930-69. GGS 2005 and vital statistics



Note: a) The values from the vital statistics refer to the class middle. E.g. the value 2.2 for the cohorts 1930-34 represents the cohort 1932. b) In the cohort fertility estimates from the vital statistics, West Germany is defined as West Germany including West Berlin until 1989. For the time after 1989, West Germany is defined as West Germany excluding West Berlin.

Source: Generations and Gender Survey 2005, *HFD* (2011), *Statistisches Bundesamt* (2001: 198).

been falling in West Germany since the 1930s cohorts. There is no reversal of this downward trend until the most recent cohorts. The GGS data, however, give a different impression of the cohort trend in total fertility. According to the GGS, fertility has been declining from the 1935-39 to the 1945-49 cohorts, but has been increasing thereafter. In essence, the GGS data reveal a biased picture of the overall cohort trends in West Germany.

Panel 2 in Figure 2 compares the weighted GGS estimates with the estimates from the vital statistics. Weighting should cure a bias that is caused by unit nonresponse. However, it seems that the weighting factor does not fully work, because it does not correct the overall misleading trend. Possibly, this may be explained by the way that the weights have been constructed.

The German GGS was drawn by a random route procedure based on ADM design (*Ruckdeschel et al.* n.d.). The criteria for selecting the sample points were: federal land, administrative district and municipality type (BIK). In a second selection step, the household addresses were picked by random route selection. The respondents in each household were then chosen by Kish selection grid. In order to generate a weight for this sample, a stepwise procedure was applied. In a first step, the design weight was generated by accounting for the federal land, municipality type (BIK) and household size. In a next step, the weight was adjusted so that it corrected for the fact that only one person per household had been contacted. Finally, the weight was refined by accounting for "known" socio-demographic distributions. For this purpose, the distributions of the population by federal land, age and sex as given by the official population statistics ("Bevölkerungsfortschreibung") were used. In addition, information on education, region and age from the Mikrozensus 2004 was integrated (see *Ruckdeschel et al*. 2006). On the whole, this complex procedure means that the weights consider standard characteristics, such as household size, age, sex and education. But they do not account for the number of children or the marital status of the respondent.

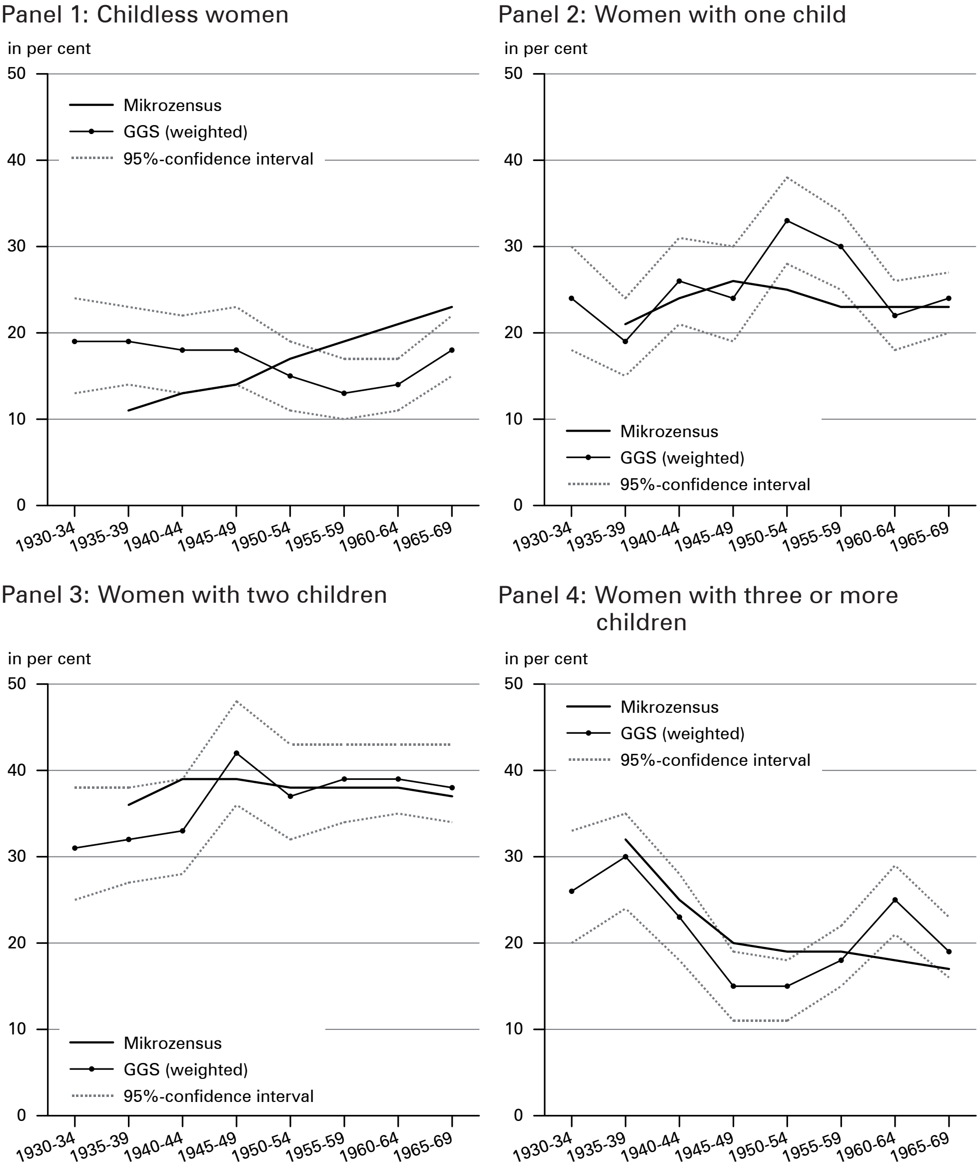
3.4.2 Parity distribution

Figure 3 graphs the parity distribution by birth cohorts of women. Here the GGS data are compared to the Mikrozensus 2008. Panel 1 provides estimates on the share of childlessness. According to the Mikrozensus, the share of lifelong childless women has been increasing since the 1940s cohorts without any sign of a trend reversal. This finding matches prior research on this topic based on social science surveys (*Kreyenfeld/Konietzka* 2007: 28). The GGS results stand in strong contrast to this finding as, according to the GGS estimates, childlessness has been declining considerably since the 1945-49 cohorts. The overall GGS trend runs counter to the trend given by the Mikrozensus. Only for the cohorts 1950-54, the Mikrozensus estimates are captured by the confidence bounds of the estimates from the GGS. For the other cohorts, one must conclude that the two samples stem from different populations.

Panels 2-4 of Figure 3 present the estimates for the share of women with one, two and three or more children. The estimates are more in line with the estimates derived from the Mikrozensus. These results may suggest that the bias is strongest for childless women while the estimates for other parities seem to be reliable. However, this is a misleading interpretation, as the family size distribution as a whole must be distorted when childless women are overrepresented in a sample. A more suitable approach to detect how higher-order fertility is captured in the GGS is to generate parity progression ratios (PPR), which are displayed in Figure 4.

Panel 1 of Figure 4 displays the PPR for the transition of women to motherhood. This transition corresponds to the share of childless women that has been discussed above. It shows that the cohort estimates from the GGS and the vital statistics run in opposite directions. There seems to be a better match for the transitions to the second and to the third child (panel 2 and 3). However, it is still disturbing to see that the GGS suggests that second and third birth rates have recently been increasing, while the Mikrozensus shows no major changes in the overall progression to the second and third child since the 1950s cohorts. For higher-order births the pattern is very uneven (Panel 4). However, one needs to consider that the sample size gets very small in the GGS since higher-order births are not very common in West Germany.

Fig. 3: Parity distribution of West German women born 1930-69. GGS 2005 and Mikrozensus 2008*

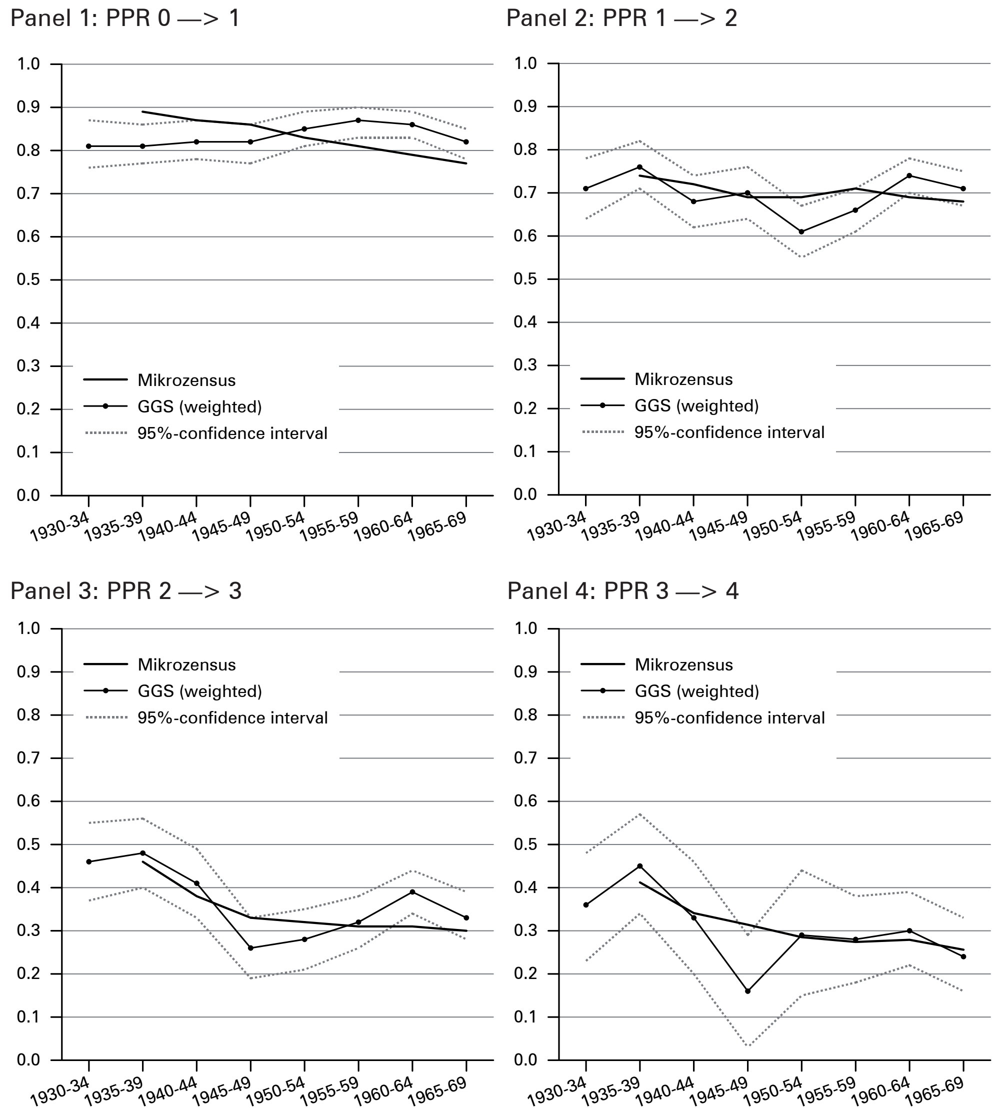


* We did not provide any confidence bounds for the Mikrozensus as the large sample size leads to very narrow confidence intervals.

Note: Estimates for the cohorts 1930-34 are not available from the Mikrozensus.

Source: Generations and Gender Survey 2005, Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, scientific use file of the Mikrozensus 2008 (own calculations).

Fig. 4: Parity progression ratio (PPR) of several fertility transitions for West German women born 1930-69. GGS 2005 and Mikrozensus 2008



Note: Estimates for the cohorts 1930-34 are not available from the Mikrozensus.

Source: Generations and Gender Survey 2005, Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, scientific use file of the Mikrozensus 2008 (own calculations).

4 Possible sources of bias

Our investigation so far suggests that there is an overreporting of births for the younger cohorts and an underreporting of births for the older ones. Our first suspicion has been that migration might distort the cohort trends in West German fertility. In particular, young East-to-West migrants who have higher first birth rates than West Germans might produce an unusually high fertility of the younger West German cohorts. Unfortunately, the first wave of the GGS does not contain migration histories nor does it include information on the region of birth. This makes it difficult to test this hypothesis. However, there are several arguments that speak against this idea. Firstly, it is unlikely that East-to-West migrants are able to strongly influence West German fertility patterns due to their relatively small number (*Vatterrott* 2011). Another aspect that refutes this hypothesis is that other surveys, which have reported an increase in the share of childlessness over the cohorts, such as the German Mikrozensus, also use information on the place of residence at the time of survey to distinguish East and West Germans. A final reason objecting to this hypothesis is that, also for East Germany, we found a decline in childlessness for the most recent cohorts in the GGS. For East Germany, there is no reason to believe that West-to-East migrants may bias the level of childlessness in the eastern German federal states. There is neither any evidence that East German women of the 1960s cohorts have had extraordinary low levels of childlessness.

If it is not migration, what may have caused the peculiar fertility pattern in the data? Our best guess is that two counteracting mechanisms are at play. On the one hand, the GGS includes too few childless respondents due to the fact that this group is difficult to reach in standard surveys, in particular in the surveys that are based on a random route design like the German GGS (*Koch* 1998; *Festy/Prioux* 2002: 23). On the other hand, we suspect that children who have left parental home have not been adequately reported by all respondents. This kind of bias should particularly affect the older cohorts whose children have more often left parental home. These two mechanisms taken together could produce a pattern that gives too few births for the older and too many births for the younger cohorts. In order to buttress our suspicion, we discuss several possible aspects that may support this reasoning.

4.1 The socio-demographic composition of the GGS

If our assumption is right that the retrospective module created a problem in the GGS, there should not be any similar distortions for other socio-demographic characteristics. Prior investigations by *Ruckdeschel et al.* (2006) have shown that highly educated people are over- and foreigners are underrepresented in the German GGS. After weighting the data, the estimates can, however, be brought in line with the Mikrozensus estimates. Since our main concern is not the overall pattern, but the cohort-specific pattern, we display standard socio-demographic indicators by birth cohorts in Figure 5. For this part of the analysis, we used the entire sample of the GGS (10,017 respondents). In order to compare our results to the source for our external validation (here the Mikrozensus 2005 of the same year like the GGS), we required the original German educational classification. Since the harmonised UN version of the GGS only contains the ISCED information, we had to go back to the data from the "original" GGS that was made available by the *Federal Institute for Population Research*.

The results show that the unweighted estimates are somewhat biased and that the bias also shows a cohort-specific pattern. Women are particularly overrepresented in the younger cohorts, but underrepresented in the older ones. In addition, university graduates are underrepresented in the older cohorts. This bias disappears, however, after weighting the data. In essence, we do not detect a very systematic bias in these socio-demographic variables. This raises the question whether it is mainly the fertility histories that create a problem in the GGS.

4.2 Is there any systematic underreporting of non-resident children in the German GGS?

Up to this point, the analysis has suggested that the bias exists concerning the number of children, but not concerning other socio-demographic variables. This supports our idea that the module where information on non-resident children was collected might have created a problem to respondents or interviewers in the German GGS. To further assess this assumption, we have compared the GGS results with another German survey, the DJI Family Survey 2000, which contains information on resident and non-resident children. The difference in the survey year might distort the results. However, for the moment we do not have any more recent survey for this kind of analysis at our disposal.[8] Table 1 presents the share of women whose children no longer live in the household (out of all women). If our assumption is correct and children who have left parental home are not adequately reported, then the share of non-resident children should be lower in the GGS than in the other survey. This assumption is partially supported by the results from the table. For the older respondents (45 years and older), the share of respondents with non-resident children in the GGS is substantially lower than in the DJI Family Survey. What is peculiar, however, is that the bias only seems to occur for the older respondents, but not for the younger ones.

4.3 Wording, technicalities and system missings

The investigation so far suggests that there may be problems in the collection of retrospective histories in the German GGS. This might have been caused by the misleading wording of the question. The retrospective module about non-resident children begins with two "filter questions". For persons who have resident children, the question is "We already talked about those children who currently live in your

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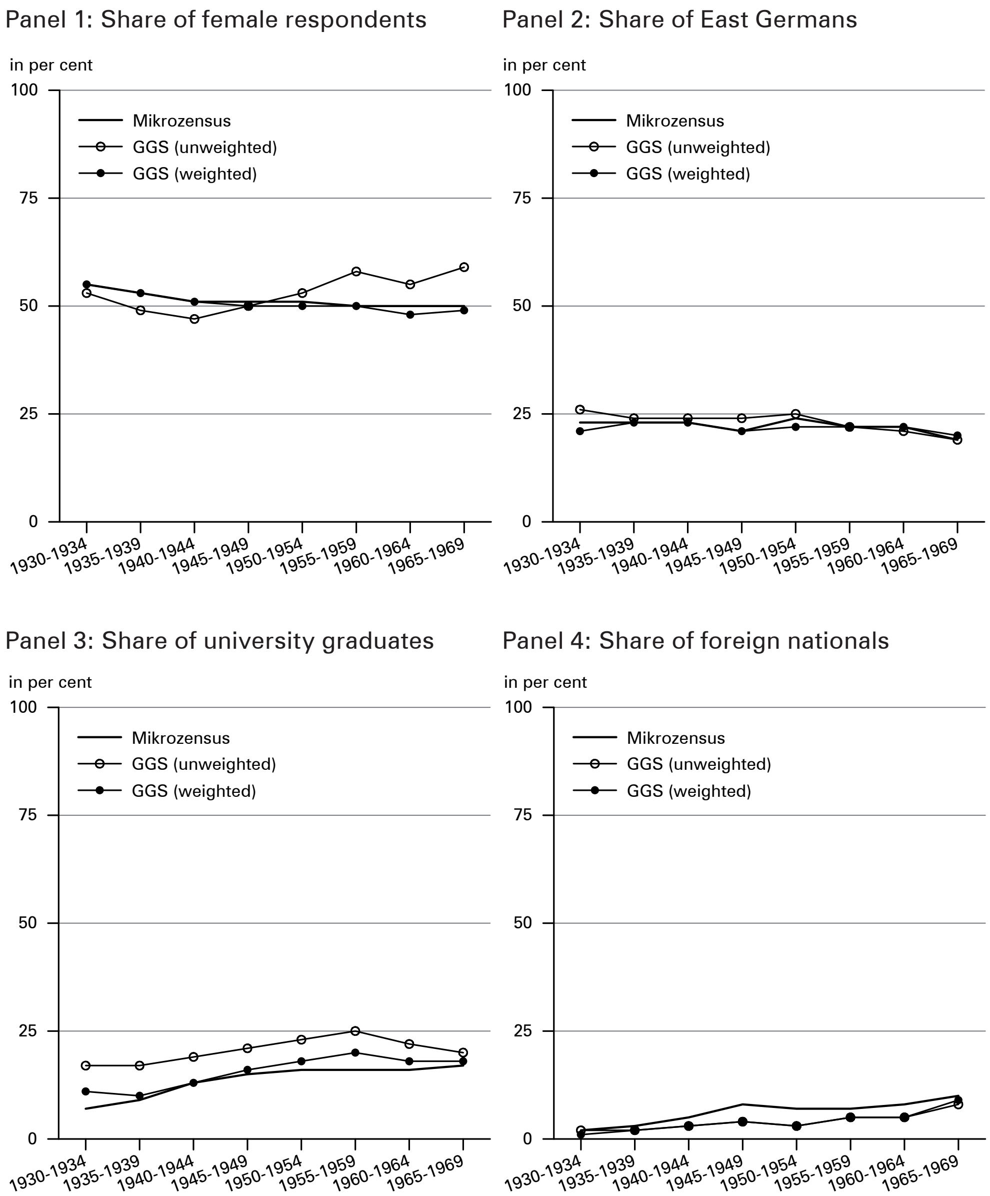
8 The data set AID:A of the German Youth Institute would provide more recent estimates, but the data were not available for scientific usage at the time this paper was written. The ALLBUS 2006 would also provide more recent evidence, but its case numbers are too small to provide reliable estimates.

Fig. 5: Socio-demographics by cohorts in the German GGS 2005 and Mikrozensus 2005



Source: Generations and Gender Survey 2005, Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, scientific use file of the Mikrozensus 2005 (own calculations).

Tab. 1: Share of West German women with non-resident children (in per cent)

Age at interview	GGS 2005	DJI Family Survey 2000
30-34	2.2	2.5
35-39	4.8	4.8
40-44	11.7	10.6
45-49	28.2	36.3
50-54	53.4	61.4
55-59	63.6	83.5

Note: West Germany comprises West Germany without West Berlin.

Source: Generations and Gender Survey 2005 (weighted estimates), DJI Family Survey 2000 (weighted estimates).

household. In addition to them, have you given birth to/fathered any other children or have you ever adopted any other children?" (German original: *"Wir haben schon über die Kinder gesprochen, die gegenwärtig in Ihrem Haushalt leben. Haben Sie außerdem noch andere leibliche Kinder oder haben Sie jemals ein Kind adoptiert?"*) For persons without co-residing children, the question is: "Have you given birth to/fathered any children or have you ever adopted any children?") (German original: *"Haben Sie jemals leibliche Kinder gehabt oder adoptiert?"*). Since in the German original question "adopted" is the last word mentioned, a hasty interviewer or respondent may have believed that the following section only referred to adopted children.

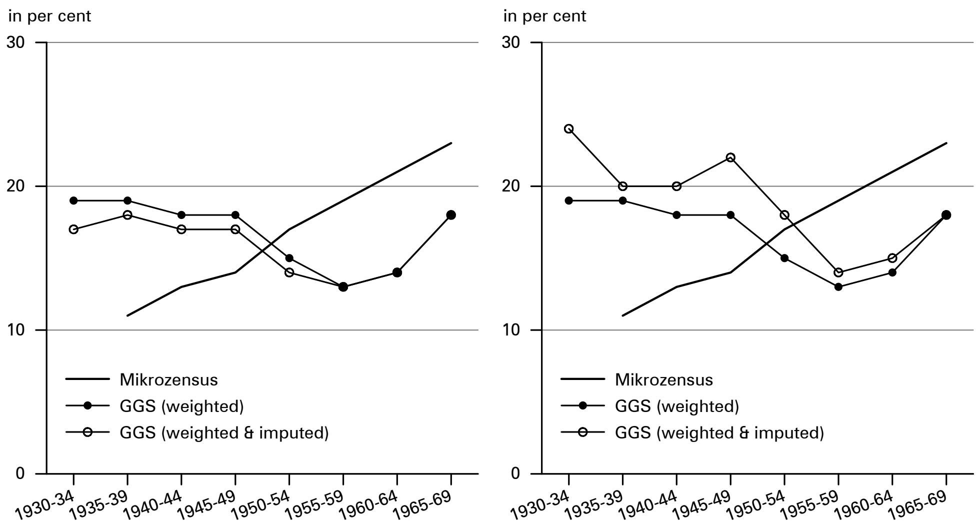
In this context, it may also be possible that the older respondents have not reported deceased children adequately. In the questionnaire respondents are asked to report if they have "given birth to/fathered any other children". In the German original, the formulation presented to the respondents is whether they *have* any other children or in case they do not have resident children whether they *have ever had* biological children. At this point, it is not specified if the children should still be alive.

Another possibility may be a filter problem directing respondents to the wrong question. It is not possible to check this aspect in the UN version of the GGS because there is only *one* variable available that indicates if a person has any non-resident children despite the fact that respondents with and without resident children were directed to two different questions. In the original version of the GGS, which we obtained from the *Federal Institute for Population Research*, the two variables are separate. Based on this data, we checked if the respondents had been directed to the right questions, but could not detect any peculiarities.

A striking aspect we found is, however, that there are quite a few cases that report having non-resident children without providing any further information on these children (57 out of 2,851 cases in our sample of West German women – cf. see Section 3.2; 9 were missing for other reasons). We have omitted these cases from the investigation. Omitting these cases may, however, distort the results. These respondents have children, but we do not know how many. Therefore, we are simply unable to consider these children in the estimates on the total number of children. However, we may consider them when generating the share of childlessness. Panel 1 in Figure 6 displays the share of childless respondents based on this imputation scheme, i.e. respondents who reported that they had non-resident children, but did not report any further information on these children have been coded as respondents with children. As can be depicted from the figure, the estimates are slightly more in line with the results from the Mikrozensus. However, there is still no sufficient match. Panel 2 in Figure 6 shows results from an imputation scheme that treats the missing cases as childless respondents. Obviously, this imputation scheme is an unrealistic one as we know that these missings are respondents with children (provided that the answer to the prior question on non-resident children was correct). We still display the results here, because it is not unlikely that other users of the GGS will treat these cases as childless respondents.

Fig. 6: Share of childless West German women by birth cohorts. GGS 2005 and Mikrozensus 2008

Panel 1: Missing=not childless | Panel 2: Missing=childless



Note: Fertility estimates for the cohorts 1930-34 are not available from the Mikrozensus.

Source: Generations and Gender Survey 2005, Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, scientific use file of the Mikrozensus 2008 (own calculations).

4.4 Marital histories in the GGS

Question wording, question placement and technical problems do not seem to be the major sources of error leading to the bias in the fertility histories. It might rather be that respondents (or interviewers) provided negative answers to the number of non-resident children in order to shorten the interview (*Ní Bhrolcháin et al.* 2011). Older respondents mostly provide their fertility information in the section of the questionnaire which surveys the children who have left the parental home. This section is rather long asking the respondents to provide many details on each child (see Fig. 1). The respondents do not know the questionnaire, so that, at this point, they cannot be aware that a lot of further detailed questions on each of the children follow. However, the interviewer knows and he or she may have recorded a "no" to the answer on the number of non-resident children to shorten the interview. If interviewers have made a strategic choice to shorten the interview, a similar problem should have occurred for other events that have been surveyed in a similarly complex fashion. Partnership histories have been surveyed according to a similar logic as fertility histories. If our hypothesis is correct that the retrospective part collecting information on non-resident children created a problem for interviewers or respondents, it should also have failed for the partnership histories.

Against this background, Figure 7 displays estimates of the proportion of ever married women by cohort based on the GGS. These are compared to estimates from the Mikrozensus of the year 2005. Contrary to fertility estimates, which basically give estimates of completed fertility, figure 7 gives the share of persons who have been married until the date of the interview which is in 2005 for both data sets. As marriage has been postponed for recent cohorts and the share of never married persons has increased (e.g. *Blossfeld/Jaenichen* 1992: 308; *Huinink* 1995: 227), one would expect that the share of married persons declined for the younger cohorts. This is the pattern that one also finds in the Mikrozensus data. For the German GGS, one gets the striking result that the share of ever-married respondents has increased since the 1930s cohorts. In sum, the marriage history shows a similar bias as the fertility histories. As both, marriage and fertility histories, show the same peculiar pattern, it seems that the nature in which this demographic information has been collected may be the source of error.[9]

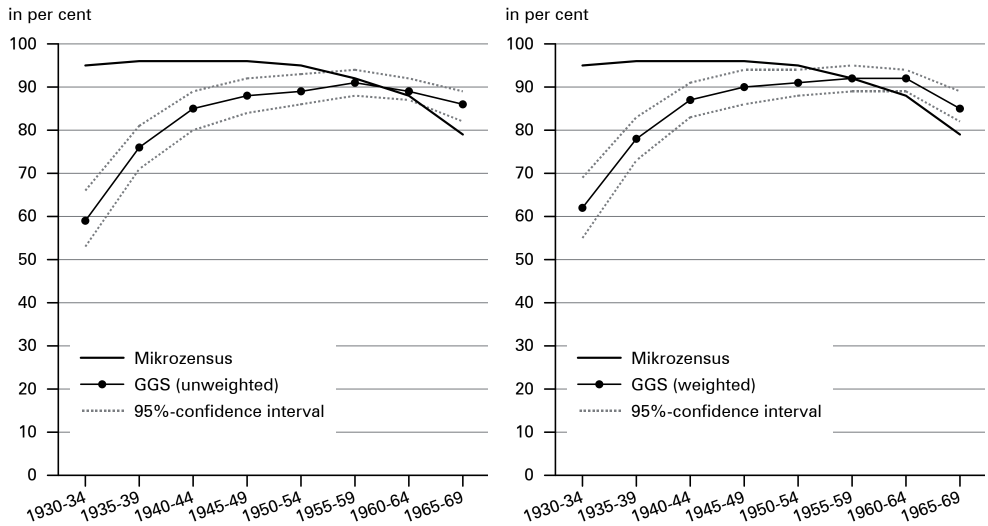
5 Conclusion

The aim of this paper was to validate fertility histories from the German Generations and Gender Survey. The mean number of children, the parity distribution as well as the parity progression ratios by female birth cohorts have been generated. We compared the GGS results to vital statistics data and to the Mikrozensus. We find

9 We also speculated that married respondents of the older cohorts have not been adequately caught by the sampling frame of the GGS. This would have resulted into a bias in the fertility and marital histories alike. To check this presumption, we also generated the total number of children for married respondents only which we compared to estimates from the Mikrozensus 2008. As the bias runs in the same direction as the prior analyses had already shown, we refuted this hypothesis.

Fig. 7: Share of ever-married West German women by cohorts. GGS 2005 and Mikrozensus 2005

Panel 1: Unweighted results Panel 2: Weighted results



Source: Generations and Gender Survey 2005, Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, scientific use file of the Mikrozensus 2005 (own calculations).

that fertility is too low for the older GGS cohorts, while it is too high for the younger ones. Weighting the data did not cure the bias.

We investigated possible reasons for the odd fertility patterns that we find in the GGS. We followed the idea that the bias might be caused by two counteracting mechanisms. On the one hand, the GGS includes too many young mothers with children, because this group is easy to reach in social science surveys, particularly in those that are based on a random route design like the German GGS. On the other hand, we suspect that children who have left the parental home have not been adequately reported by all respondents due to the complex nature of how non-resident children are surveyed in the GGS. These two mechanisms taken together have produced a pattern that gives numbers of children, which are too low for the older and too high for the younger cohorts.

There are two aspects that support this idea. Firstly, we find a similar bias for the marital histories of the German GGS. Our comparison with the data from the Mikrozensus reveals unreasonably low shares of married women for the older cohorts (especially, for the ones born 1930-39). Since the partnership histories are surveyed in a similarly complex fashion as the fertility histories, the source of bias might also be similar. Moreover, comparison with other data gives some support for the idea that vital events are underreported in the German GGS due to the fact that the retrospective module did not capture the non-resident children in a satisfying manner.

This is only a best guess of what the source of bias in the GGS could be. We can, however, back up our reasoning with reference to a paper by *Sauer et al.* (2012), which supports our notion that the complexity of the retrospective histories created a particular problem in the collection of the data for Germany.

It was very difficult for us to assess the quality of the fertility information from the German GGS, particularly because item nonresponse was very difficult to track. Furthermore, we desired a simple question asking respondents how many children in total they had born/fathered over their life course. Unlike its predecessor, the Fertility and Family Survey (FFS), the GGS did not contain such a simple question anymore. The same can be said for partnership or marriage. Here, one dearly missed a simple question that would have surveyed the marital status at the time of the interview. Such a simple general question would have been highly valuable to check the quality of the partnership information given in the retrospective partnership histories.

Finally, it should be underlined that a lot of aspects remain unresolved. In particular, it remains unclear why this pattern evolved only for Germany. As far as we know, such a bias has not emerged for other GGS countries that used similar questionnaires (*Neels et al*. 2011). Furthermore, it remains unclear how to cure this bias. For other GGS countries, special weights have been designed to resolve it (*Buber* 2010). A similar strategy has been followed by the German family panel (pairfam), where special weights have been designed that also draw on the parity distribution generated from the Mikrozensus 2008 (*Brüderl et al.* 2012: 45). However, for the German GGS, such a weighting factor would only be an unsatisfactory remedy to the problem as weighting should usually address unit nonresponse. If faulty information in the retrospective module is the source of error, weighting may not be the preferable solution to the bias. One may rather conclude that the German GGS is simply unable to depict the cohort changes in partnership formation and fertility and should thus not be used for such kind of analyses.

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Appendix

STATA Code for generating fertility information from the German GGS

```
use $SOURCE\GGS_Wave1_Germany_V.3.0.dta, clear

* Correction of mistakes in household grid
        replace ahg3_2=1 if arid==31941
        replace ahg3_2=1 if arid==366
        replace ahg3_4=1 if arid==42455
        replace ahg3_2=1 if arid==44983
        replace ahg3_2=1 if arid==33108
        replace ahg3_2=1 if arid==44931
        replace ahg3_3=2 if arid==40393
        replace ahg3_4=2 if arid==40393
        replace ahg3_5=2 if arid==40393

* Number of children in household (BIO_IN)
        g BIO_IN=0
        local i=0
        while `i'<10        {
        local default1 =`i'+1
        replace BIO_IN=BIO_IN+1 if ahg3_`default1'==2  | ahg3_`default1'==3
        local i=`i'+1
                            }
        local i=0
        while `i'<10        {
        local default1 =`i'+1
        replace BIO_IN=-1 if ahg3_`default1'==.a | ahg3_`default1'==.c
        local i=`i'+1
                            }

* Number of biological children not in household (BIO_OUT)
        g BIO_OUT=0
        replace BIO_OUT=-1 if a209==.a | a209==.c | a209==.
        local i=0
        while `i'<9         {
        local default1 =`i'+1
        replace BIO_OUT=BIO_OUT+1 if a213_`default1'==1
        local i=`i'+1
                            }
        local i=0
        while `i'<9         {
        local default1 =`i'+1
```

```
        replace BIO_OUT=-2 if      (a213_`default1'==.a | a213_`default1'==.c)
        local i=`i'+1
                    }
        g TEST=.
        local i=0
        while `i'<9 {
        local default1 =`i'+1
        replace TEST=1 if (a213_`default1'==1 | a213_`default1'==2| a213_`default1'==3)
        local i=`i'+1
                    }
        replace BIO_OUT=-3 if      TEST==. & a209==1

        lab def BIO_OUT -1 "no information on 'filter-question' (a209)"
        lab def BIO_OUT -2 "resp has non-r kids, but unclear if bio (a213b=.a/.c)", add
        lab def BIO_OUT -3 "resp has non-res kids, but unclear if bio (a213b=.)", add
        lab val BIO_OUT BIO_OUT

* Total number of children (UNIKID)
        g UNIKID=BIO_IN+BIO_OUT
        replace UNIKID=-1 if BIO_IN<0 | BIO_OUT<0

* Selection
        keep if aplace>=140010 & aplace<= 140100
        keep if  ahg4_1==2
```

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