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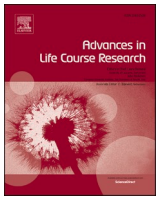

Religiosity and trajectories of lifetime fertility intentions – Evidence from a German panel study

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ABSTRACT

Much of the literature on fertility intentions has shown that they are broadly predictive of fertility behaviour. Fertility intentions tend to change over a person's life. How religiosity affects these changes over time has rarely been the subject of investigation. In this paper, we focus on whether and how religiosity affects trajectories of lifetime fertility intentions. Specifically, we examine whether highly religious people start with higher fertility intentions and are more likely to sustain them during their life course compared to their less religious counterparts. We apply random and fixed effects growth curve models to data from the German family panel pairfam, using a sample of 6214 women and 5802 men aged 14–46. We find that religiosity mainly contributes to explain the starting level at teenage years but not the trajectories of lifetime fertility intentions as people get older. Highly religious people start with higher intentions than less religious people. However, similarly to less religious people they experience a decline in their fertility intentions with age. This study demonstrates that religiosity is an important variable in research on fertility intentions but with changing relevance over the life course.

1. Introduction

Fertility intentions have become a widely used tool to study the fertility decision-making process (Dommermuth et al., 2015). Over the life course, however, they are not static but are instead constantly changing as individuals adjust their intended family sizes, for example as a response to changing circumstances in life (Hayford, 2009; Heiland et al., 2008; Iacovou & Tavares, 2011; Liefbroer, 2009; Philipov & Bernardi, 2011). Fertility intentions are usually divided between short-term fertility intentions, and lifetime fertility intentions which comprise the total intended family size (Berrington & Pattaro, 2014; Philipov & Bernardi, 2011). The trajectories of these lifetime fertility intentions show a considerable degree of heterogeneity – while most American women tend to sustain them during their reproductive career, a considerable share of women follow a downward trajectory and a smaller share even has increasing intentions (Hayford, 2009). Similarly, another study on Dutch women and men suggest that on average the adjustment of intentions is downward, with some exceptions (Liefbroer, 2009). Research on the reasons and drivers of changes in and trajectories of lifetime fertility intentions constitutes an emerging field in demography and different determinants have already been found. In this study, we want to address the impact of religiosity on trajectories of lifetime fertility intentions.

Religiosity has already been singled out in the literature as positively influencing fertility intentions and in certain instances also the realisation of these intentions (Bein et al., 2017; Buber-Ennser & Berghammer, 2021; Dantis et al., 2023; Philipov & Berghammer, 2007). However, so far religiosity has received little attention as a potential determinant of trajectories of fertility intentions over the life course. In particular, and in view of the literature showing that highly religious people evaluate the costs and benefits of children differently to less religious people (Bein et al., 2021), it could be that they are also more likely to sustain their higher fertility intentions over time. Specifically, previous studies have demonstrated that for highly religious people, perceived costs play a less prominent role in the fertility decision-making process than for less religious people (Arránz Becker & Lois, 2017). This could mean that when the perceived consequences of having children change, highly religious people might be less likely to change their fertility intentions in

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response to this change since those consequences do not play a central role in the formation of their fertility intentions. Furthermore, some other background factors explaining high fertility intentions among people who are more religious, such as the impact of pronatalist religious teachings (e.g. be fruitful and multiply), are rather stable over time and may also contribute to more stable fertility intentions among them and prevent downward adjustments to the total intended family size.

In order to evaluate the relationship between trajectories of fertility intentions and religiosity, we use a sample of men and women of reproductive age from the German Family Panel pairfam (Panel Analysis of Intimate Relationships and Family Dynamics), whose data was collected between 2008 and 2018 (Brüderl et al., 2019). In our study, lifetime fertility intentions are defined by the total intended family size and are measured by the sum of the number of existing children and the number of further intended children in the life course. For assessing the trajectories of those intended family sizes, growth curve models are estimated. Our analyses show that high religiosity mainly affects the starting level of fertility intentions but not the trajectories.

2. Theoretical and empirical background

2.1. Lifetime fertility intentions and their change

This study focuses on lifetime fertility intentions. Fertility intentions are related to other concepts often used in research on the fertility decision-making process, such as fertility ideals or desires, but they differ in some important aspects (Miller et al., 2004; Philipov & Bernardi, 2011). Fertility ideals often tend to represent the general idea in a society of how a family is supposed to look like regarding its size (Girard & Roussel, 1982). Fertility desires on the other hand refer to personal preferences of family sizes (ibid.) While both fertility ideals and desires are generally understood as being formulated without the consideration of any inhibiting factors or obstacles (as operationalised in the pairfam question; see: Brüderl et al., 2019), fertility intentions take those obstacles into account as they refer to concrete plans of having children (Miller & Pasta, 1994, 1995). Often, fertility intentions are theoretically based as a psychological construct, either using the theory of planned behaviour (Ajzen, 1991; Ajzen & Klobas, 2013) or the Traits-Desires-Intentions-Behaviour framework (Miller & Pasta, 1994). These theories usually distinguish between short-term intentions (over the next two or three years), and long-term or lifetime intentions. The latter are often referred to as a "realistic" number of children that is expected over the rest of the life course. However, these lifetime intentions involve a number of uncertainties (Philipov & Bernardi, 2011) which makes them suspect to change over time as life conditions change.

The formation of fertility intentions depends on many different aspects. One aspect includes the perceived costs and benefits of having children (Becker, 1981; Hoffman & Hoffman, 1973). It has been posited that the plan to have a child is made if those perceived benefits – such as emotional motives, affiliation and the desire for family ties, sense of accomplishment or economic benefits – outweigh perceived costs – which include monetary costs, lost career opportunities, stress and worries.

Despite being understood as concrete plans, individual fertility intentions do change over time (Hayford, 2009; Heiland et al., 2008; Iacovou & Tavares, 2011; Liefbroer, 2009). Part of the reason for these changes is that people are not always certain about their fertility plans (Morgan, 1982; Philipov & Bernardi, 2011), especially when they are young and the plans concern a long timeframe. Over a long time horizon, the likelihood that fertility intentions change increases due to the complex and multidimensional nature of the life-course coupled with interactions of different dimensions such as social networks, work and family (Bernardi et al., 2019). In a study on the US for example, Gemmill (2019) found that among later permanently childless women, 85% expected to have children later in life when asked at age 21. The pressure of fulfilling societal norms regarding the number of children a woman should have and regarding the timing of these children adds to the uncertainty of fertility intentions, as those norms held by society may not always be in line with individual desires and turn out to be unrealistic. This is also one of the reasons why changes in fertility intentions over the life course are much more often downward than upward. Another reason is the dyadic adjustment of intentions among women and men in partnerships (Miller et al., 2004), where couple disagreement has negative effects for higher parities (Testa, Cavalli, & Rosina, 2014). Other studies on the stability of fertility intentions found that the stability of intentions depends, among other factors, on career and partnership pathways (Liefbroer, 2009), employment uncertainty (Hanappi et al., 2017), the number of children initially intended (Iacovou & Tavares, 2011) or previous births and education levels (Hayford, 2009).

2.2. The impact of religiosity on trajectories of lifetime fertility intentions

Considering that there is a positive correlation between religiosity and fertility outcomes (Adserà, 2006a; Baudin, 2015) and intentions (Bein et al., 2017; Buber-Ennser & Berghammer, 2021; Dantis et al., 2023; Philipov & Berghammer, 2007) in the Western and Christian context, the question arises as to whether religiosity also plays a role in determining individual trajectories of fertility intentions. While there are indications that the stability of fertility desires differs by religious denomination in the short-term (Heiland et al., 2008), individual religiosity and the likelihood of sustaining a higher trajectory of fertility intentions over the life course has not yet been taken into account in previous research. Nevertheless, people with the highest levels of religiosity sustaining fertility intentions at a higher level throughout their life course could explain part of the mechanism that links high religiosity and high fertility. Key in this regard is how highly religious people form fertility intentions and in which ways they form them differently from those who are less religious. Before evaluating this mechanism, it is also important to mention that similar to fertility intentions, religiosity is not stable but can change over the life course as well. It was found that religiosity tends to decrease during young adulthood (Hayward & Krause, 2013), but then increases slightly during middle and late adulthood (Bleidorn et al., 2022). Life events such as entering the first marriage, having school-aged children and entering widowhood tend to increase the frequency of attending religious services (Lois, 2011).

Overall, religions encourage their followers to have many children by communicating and propagating pronatalist norms (Adserà, 2006b), traditional gender roles (McQuillan, 2004) and related family values like the importance and sanctity of marriage (Mahoney et al., 2003). The Roman Catholic Church for example stresses the sacredness of marriage and the importance of procreation within marriage (Catechism 2366–2379). The higher tendency of religious people to marry has indeed been shown to be an important factor of their higher fertility (Brose, 2006). Religions also encourage childbearing by providing networks of social support that are conducive to larger families (McQuillan, 2004). By attending religious services frequently and thus being more often in contact with likeminded people, the highly religious are more exposed to those pronatalist norms (Adserà, 2006b) and can make use of these social support networks. Hence, the frequency of attending religious services is often used as a measurement of religiosity, including this study. Furthermore, it has been suggested that religions might also

"shield" their followers from negative consequences of parenthood (Philipov, 2011).

One possible way in which religiosity could lead to sustained higher fertility intentions relates to how highly religious people differ from the less religious in their evaluation of benefits and costs of having children. Religious people generally see higher benefits of having children (Arránz Becker & Lois, 2017; Bein et al., 2021; Brose, 2006) and especially values of children (VOC) grouped by Hoffman and Manis (1979) under the label of morality such as "children may make you a better person", "less selfish", "more settled down" and seeing "children as a blessing" are associated with a religious background (Hoffman & Hoffman, 1973; Hoffman & Manis, 1979). Religious people also tend to see lower costs of having children (Arránz Becker & Lois, 2017; Bein et al., 2021). They are therefore more likely to decide in favour of having children. Where the costs associated with childbearing (either objective or subjective costs) are perceived to be lower, this can also be expected to decrease the likelihood of downward adjustments of fertility intentions over the life course, since changes in costs or opportunity costs are a major determinant of changes in fertility intentions (Hanappi et al., 2017).

The assumption that the plan to have a child is a rational choice, based on costs and benefits for example, is questioned in sociological and psychological approaches on fertility (Miller & Pasta, 1994). Some theoretical models on actions suggest that the amount of rationality on which a plan or decision is based can vary on a spectrum, between a completely rational choice on the one hand, and an automatic and spontaneous choice on the other (Esser & Kroneberg, 2015). In previous research on religiosity and fertility, it has been claimed that highly religious people may be more likely to base their fertility planning on a more automatic and spontaneous assessment than people who are less religious (Arránz Becker & Lois, 2017). One reason is that pronatalist norms such as "be fruitful and multiply" (Genesis 1:28), that are inherent in many religions, are more internalised by highly religious people. As a result, the answers they give to questions on fertility intentions are more likely to be in line with the teachings of their particular religion. People who are less religious, and who are less likely to have these pronatalist norms internalised in their fertility decision-making, are assumed to give more weight to a rational choice. These differences have consequences for the stability of fertility intention trajectories as well. Fertility plans that are mostly based on religious norms are less likely to be changed (especially downwards) over time than fertility plans based on aspects of a rational choice. Based on these considerations, we hypothesize that *highly religious people start with higher lifetime fertility intentions and are more likely to sustain higher intentions as they get older compared to the less religious.*

3. The context of Germany

Fertility levels in Germany have been relatively low for a long time in comparison to most other Western countries. Between German reunification in 1990 and 2015, the total fertility rate was between 1.2 and 1.4 children per woman. For western Germany, this low level has been explained mostly by the difficulties experienced by women in reconciling and combining a career with having children, while in eastern Germany, where childcare availability is higher, high unemployment rates and low incomes contribute more to low fertility (Dorbritz, 2008). More recently, the total fertility rate has experienced a marginal rise to just under 1.6 children per woman in 2018 (Statistisches Bundesamt, 2019). This recent rise can be attributed to several factors, namely policies aimed at improving the reconciliation between family and career, an improved situation on the labour market and immigration of women from high-fertility countries (Pötzsch, 2018). Despite this rise, Germany's fertility rate is still rather low. Furthermore, Germany is also characterised by a high level of childlessness in comparison with the rest of Europe (Kreyenfeld & Konietzka, 2017).

Like in most other European countries, Christianity is still the dominating religion in the German case. While in most European countries, a single Christian denomination like Catholicism or Orthodoxy dominates, Germany is one of the few countries with a rather mixed Christian community, alongside countries like the Netherlands, Latvia or Estonia (Pew Research Center, 2018). In 2018, around 28% of people were affiliated with the Catholic Church and 25% with the Evangelical Church of Germany. A further 3% belonged to other Christian denominations, while 38% were not affiliated with any faith and a minority of 6% followed non-Christian religions, mostly Islam (fowid, 2019). The share of denominations varies considerably at the regional level – in eastern Germany, the large majority of the population is not affiliated with any religion, while Catholics mostly live in the southern and western parts of the county. Protestants, on the other hand, tend to live in north and central Germany (fowid, 2021). During the baby boom in the 1950s, Catholicism was still associated with higher expected and completed fertility in comparison to Protestantism (Freedman et al., 1959). Nowadays, studies have shown that Catholics do not have a fertility advantage over Protestants anymore on the individual level (Ottenbacher, 2020; Philipov & Berghammer, 2007). Yet, a high proportion of Catholics is still associated with higher cohort fertility at the district level (Bujard & Scheller, 2017). In recent times, the share of people not affiliated with any faith has grown markedly, following the trend towards secularisation across the Western world (Norris & Inglehart, 2004). Due to migratory movements, the share of non-Christians has grown as well. Despite the fact that the majority of the German population adheres to a faith, Germany is one of the more secularised countries in Europe when it comes to religious practice. According to a Pew survey from 2018, around 24% indicated that they attend religious services at least once per month, while 11% say that religion is very important in their life[1] (Pew Research Center, 2018), figures that are lower than most southern and eastern European countries and more in line with France or the United Kingdom. Countries that are more secularised than Germany within Europe include most Nordic and Baltic countries.

4. Data and methods

4.1. Data

For this study, we use data from the German family panel (pairfam, Release 10.0: Brüderl et al., 2019). Pairfam is a longitudinal survey that collects data on partnerships and family dynamics in Germany. The panel consists of a nationwide representative sample of women and men from three birth cohorts (1971–1973, 1981–1983, and 1991–1993), their partners, parents and children (Huinink et al., 2011).

In our analyses, we use information on the main respondent (the anchor) only in the waves where data on our main independent variable religiosity was collected, i.e. Wave 1, Wave 5 and Wave 9. Data for the first wave was collected in 2008–2009, while data for Wave 9 was collected in 2016–2017. We do not use data from the DemoDiff sample. The initial sample at Wave 1 includes 12,402 men and women. By Wave 9, 4424 respondents remain in the sample. The raw sample includes 23,087 observations. We include in our analyses all respondents who participated in at least one wave across the observation period. Missing values on the dependent variables (don't know/no answer) reduce the sample size to 20,805 observations. Furthermore, 56 observations (0.27%) have to be excluded due to missing information regarding religiosity, incorrect gender entries, or unidentifiable region of birth. The analytic sample consists of 6097 women and 5602 men providing 11,046 and 9706 observations respectively. The three waves panel covers almost the full age range from 15 to 46 years old as respondents

[1] Contrary to our sample of women and men born in 1971–1973, 1981–1983 and 1991–1993, the Pew survey described here is representative of the whole adult population of Germany aged 18 and older, hence the different results compared to our descriptive results in Table 1.

who started in Wave 1 at ages 15–17, 25–27 and 35–37 years are 23–25, 33–35 and 43–45 in Wave 9.[2] The average number of observations per person is 1.8 for women and 1.7 for men.

With 4424 respondents remaining at Wave 9 out of 12,402 respondents at Wave 1, the panel attrition across the observation period amounts to 64%. This can be considered a high rate of attrition and may skew our analyses. Research on the determinants of leaving the pairfam panel between Wave 1–6 found no distinctive patterns of attrition according to various socioeconomic variables and revealed that the structure of the sample remains the same across the waves (Müller & Castiglioni, 2015). Although Müller and Castiglioni (2015) did not test the impact of religiosity on panel attrition, their conclusions suggest that there are no major differences in this respect.

4.2. Dependent variable

We quantify fertility intentions by the total intended number of children. This variable consists of the sum of two parts: first, the total number of biological children that a respondent already has (including pregnancies of the respondent or the respondent's partner); and second, the number of additional children that the respondent intends to have. For this variable, different terminologies exist in literature, for example "lifetime fertility intentions" (Beaujouan & Berghammer, 2019), "intended family size" (Berrington & Pattaro, 2014), "expected fertility" (Iacovou & Tavares, 2011) or "ultimate expected number of children" (Berent, 1983). All of these concepts can be interpreted as measuring the same thing — plans for childbearing that take constraints into account (Iacovou & Tavares, 2011, p. 90) but differ fundamentally from fertility desire or fertility ideals (Philipov & Bernardi, 2011). In this study, we use the term "lifetime fertility intentions".

In Wave 1 the question asked to ascertain the number of additional intended children was as follows: "When you think realistically about having (additional) children, how many (more) children do you think you will have?" Since some respondents misinterpreted this question and answered it by giving the total number of children they planned, we followed the suggestion of Buhr and Huinink (2014) and apply the more conservative version of their method to adjust the responses for this variable in those cases where it was likely that the respondent had indeed misinterpreted the question. In order to identify these cases, Buhr and Huinink (2014) used other variables like short-term fertility intentions, fertility ideals, expected age at next birth and information on pregnancies, and compared them with the stated intended number of additional children to find inconsistencies. 7.4% of all values in Wave 1 are adjusted accordingly.

After Wave 3, the question asked in the survey to determine fertility intentions was changed due to those issues. Childless respondents were presented with the question "When you think realistically about having children, how many biological or adoptive children do you think you will have?" Respondents who already had children were asked two questions: first, about whether they actually want additional children ("When you think realistically about having additional children, do you think that you will have more biological or adoptive children in addition to your current children or stepchildren and the child you are currently expecting?"); and second, if yes, how many ("How many more biological or adoptive children do you think you will have in addition to your current children or stepchildren and the child you are currently expecting?").

Fig. 1 shows the distribution of lifetime fertility intentions. Women and men in our sample intend to have between 0 and 10 children. Most women and men intend to have two children. The number of those who intend to have one or three children is very similar. Four children or more are rarely intended.

[2] There are some respondents in the actual data who were aged 14 at first interview and 46 in Wave 1 that we keep in the analytic sample.

4.3. Independent variables

Our key independent variable is religiosity. It is represented by the frequency of attending religious services. We distinguish three levels of religiosity: never/unaffiliated, less than monthly, monthly and more often. This categorization follows the approach used by Peri-Rotem (2016) in the highly secularized Western European context and aims at distinguishing regular from non-regular attenders of religious services, where monthly and more frequent attendance is generally seen as a sign of regular attendance (Burkimsher, 2014). The question on religiosity was included in pairfam in Waves 1, 5 and 9[3]. Sufficient within-person change can be observed: Approximately one in five women and men report either one or two changes in the frequency of attendance of religious services.[4] Age of respondent in years is our indicator of time for the analysis of trajectories. Age varies between 14 and 46 years. For the multivariate analyses age is centered (age-14) to enable interpretability of the constant term.

Furthermore, several control variables are included in our model. Cohort is an indicator that identifies respondents from the three birth cohorts included in the original pairfam sample (1971–1973, 1981–1983 and 1991–1993). The time-varying indicator for relationship status is based on the pairfam variable *relstat*. We distinguish the following categories: no partner, partner but not married, partner and married, missing information. The indicator for region of origin is based on the pairfam variable *cob*. In terms of region of origin, a distinction is made between respondents born in West Germany, East Germany, or abroad. For the level of education, we combine information from the *school* and *vocational* training indicators available in pairfam. The variable differentiates between the following levels of education: low, vocational, academic. Two additional categories are added for those currently in education at time of interview and for those with missing information on education.

As for religiosity, information on religious affiliation was included in the pairfam questionnaire only in Waves 1, 5 and 9. The indicator for religious affiliation consists of six categories: Evangelical Church, Catholic Church, other Christian denomination, other religion, no affiliation and missing values. See Table 1 for a description of the analytic samples for women and men regarding the variables included in the analyses.

4.4. Analytic approach

To evaluate trends and levels of lifetime fertility intention over time, we make use of linear growth curve models, an approach that is particularly attractive for longitudinal data (Rabe-Hesketh & Skrondal, 2012; Singer & Willett, 2003). Growth curve models can be conceptualized as a special case of multi-level random coefficient models where individual observations (Level 1) are nested within persons (Level 2) and it is the coefficient of time that is allowed to vary randomly between respondents (Rabe-Hesketh & Skrondal, 2012, p. 343; Steele, 2008). In our case, we are interested in age trajectories of lifetime fertility intentions and their variation by level of religiosity, thus our time variable is age in years.

Adapted from Rabe-Hesketh and Skrondal (2012, p. 347) the equation of the random effects growth curve model can be written as follows:

[3] In Wave 1, the question on religiosity was only asked to respondents who mentioned a religious affiliation. Later the question was asked to all respondents, irrespective of a religious affiliation. The share of those who did not receive the question on religiosity in Wave 1 (those with no religious affiliation) amounts to approximately 28%. A slightly higher probability of being very religious can be observed in Wave 1 in comparison to Waves 5 and 9. Overall, the distribution across levels of religiosity is very similar across the three waves.

[4] Among those with change, only upward (38.4%) and only downward (43.6%) adjustments are most common, 18.1% experience both upwards and downwards adjustments.

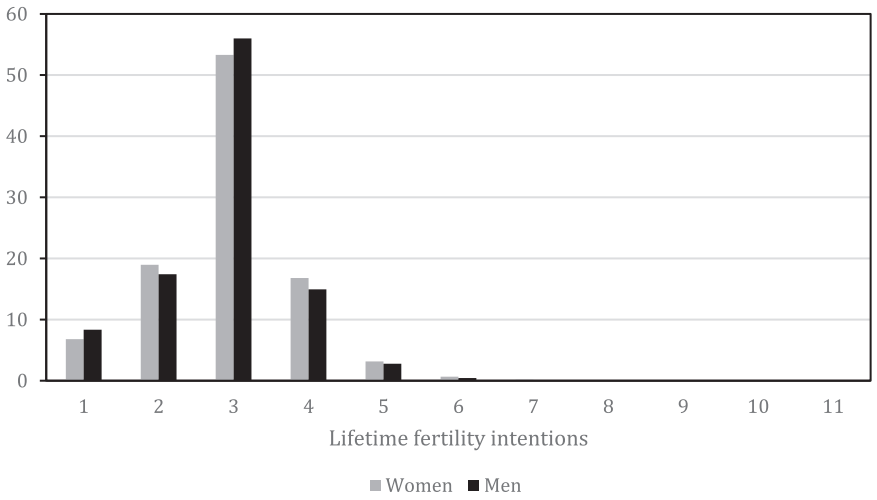

Fig. 1. Distribution of lifetime fertility intentions (in %). Data: pairfam v10.0, Waves 1, 5 & 9, own calculations.

Table 1
Descriptive statistics of the analytic sample, by gender.

	Women		Men	
	% / Ø	n	% / Ø	n
Lifetime fertility intentions	1.941	11046	1.882	9706
Religiosity				
Never/unaffiliated	40.2	4436	44.9	4355
Less than monthly	47.8	5285	43.7	4245
Monthly and more often	12.0	1325	11.4	1106
Age	29.0	11046	28.0	9706
Birth cohort				
1991–1993	33.6	3715	37.3	3624
1981–1983	29.8	3289	31.1	3015
1971–1973	36.6	4042	31.6	3067
Relationship status				
No partner	28.8	3177	39.7	3858
Partner, not married	34.0	3751	31.5	3053
Partner, married	36.9	4081	28.5	2764
Missing value	0.3	37	0.3	31
Religious affiliation				
Evangelical Church	32.4	3584	31.2	3025
Catholic Church	30.9	3411	28.8	2800
Other Christian	2.3	256	2.0	197
Other	5.9	652	6.9	667
None	28.3	3128	30.9	2997
Missing value	0.1	15	0.2	20
Region of origin				
West Germany	73.6	8126	75.9	7371
East Germany	14.1	1559	13.6	1318
Abroad	12.3	1361	10.5	1017
Education level				
In education	28.3	3121	31.9	3099
Low	7.6	844	6.8	656
Vocational	46.6	5151	45.0	4369
Academic	17.1	1886	15.9	1544
Missing value	0.4	44	0.4	38
Persons		6097		5602
Observations		11046		9706

Data: pairfam v10.0, Waves 1, 5 & 9, own calculations.

$$\gamma_{ij} = \beta_1 + \beta_2 X_i + \beta_3 X_{ij} + \beta_4 t_{ij} + \beta_5 t_{ij}^2 + \zeta_{1j} + \zeta_{2j} t_{ij} + \epsilon_{ij} \quad (1)$$

where γ_{ij} denotes our linear dependent variable lifetime fertility intentions of person i at time point j. Let X_{ij} and X_i be vectors of time-varying and time-constant variables respectively. t_{ij} is the corresponding age and t_{ij}^2 reflects age squared. This implies that we are modelling age using a quadratic term, rather than a linear term. During preliminary analyses, we also considered a cubic function. The cubic term was positive and significant in most models, but the effect size was very small. For this reason and since the graphic inspection of the age pattern of the dependent variable (see Fig. 2) rather suggests a bell-shaped pattern we opted for the parsimonious option, modelling growth using a quadratic term. In the so-called fixed part of the equation, ζ_{1j} is the random intercept and ζ_{2j} is the random slope for age. This implies that we allow slopes of each subject to vary and get an estimate of that variation (in our case the mean standard deviation of subject-specific slopes) in our analytic sample. In this part of the equation, the quadratic term for age is not included. In preliminary analyses, we included the quadratic term for the random slope, but the model did not converge. In our data, we have a maximum of three observations per person. Thus, it is likely that there is insufficient within-subject information available to estimate the non-linear growth. According to Rabe-Hesketh and Skrondal (2012, p. 348 f), in such cases it is a feasible approach to allow only the lower order term to vary randomly between subjects. ϵ_{ij} is the occasion-specific error term. As our aim is to investigate if and how age trajectories vary by level of religiosity, in a next step we add an interaction effect of religiosity with the quadratic function of age to the equation above.

We ran all final models with and without cluster-robust standard errors, but the differences were minor and did not change the substantial conclusions from the study. Consequently, we decided against estimating corrected standard errors for the models that we show. All analyses were performed using Stata/SE 16.0 statistical package.

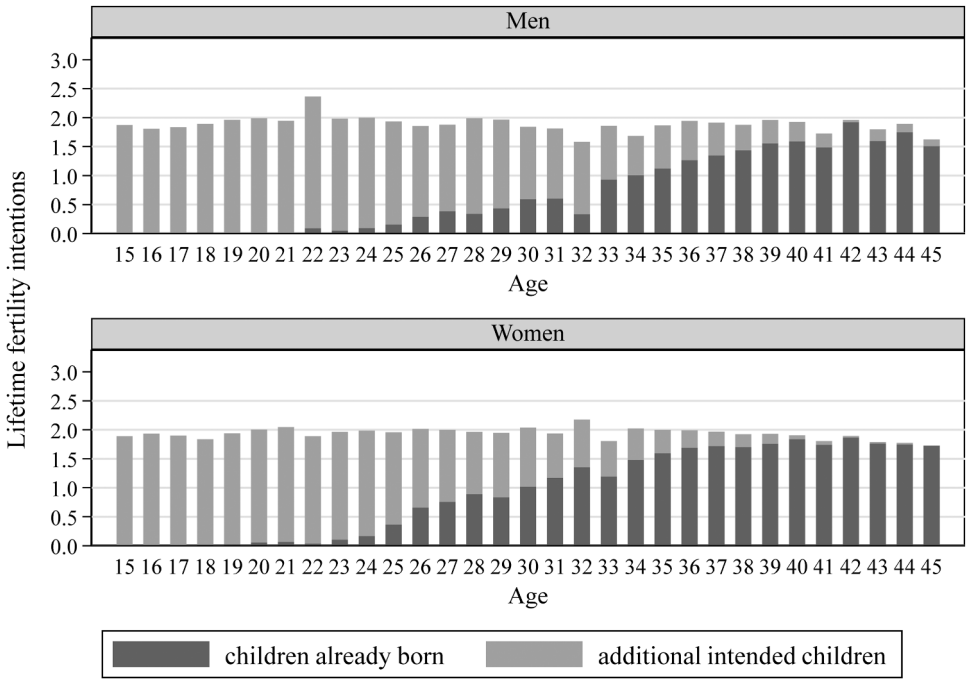

Fig. 2. Composition of average lifetime fertility intentions. Data: pairfam v10.0, Waves 1, 5 & 9, own calculations.

5. Results

5.1. Descriptive findings

Fig. 2 gives an overview of the composition of average lifetime fertility intentions for women and men by age. At younger ages, intended children dominate. The contribution of intended children to the total decreases with age as women and men start having children in their early twenties. Men have children at later ages and biologically can have children longer, thus, the contribution of intended children starts to decline later and at lower levels.

Fig. 3a and Fig. 3b show the age-trajectories of lifetime fertility intentions for different levels of religiosity. To facilitate interpretation, we applied smoothed three year moving averages, as there is some noise in the data. At same ages, cell sizes are very small, particularly when differentiating by the level of religiosity. Nevertheless, with regard to religiosity the pattern is very clear: Women and men with higher levels of religiosity are at higher age-trajectories of average lifetime fertility intentions. Those who attend religious services at least once a month already have higher lifetime fertility intentions at a very young age and they remain at that higher level across the life course.

The trajectories of average lifetime fertility intentions for women and men (total) suggest a slightly bell-shaped pattern, with an increase at younger ages followed by a slight decrease at later reproductive ages. It is important to understand how decreases in the composite measure of lifetime fertility intentions can happen. People intend to have more children than they actually have, however, as they start having children the number of further intended children is typically adjusted downwards, particularly for women as they get closer to the end of the reproductive period (see also Fig. 2). Even if people do not have any children or start having them late in the reproductive period, the number of intended children is likely adjusted downwards at some point as (subjectively perceived) chances of having children become smaller. Moreover, when interpreting the trajectories, it has to be considered that due to the cohort design of pairfam, the three birth cohorts contribute to different parts of the age trajectories: at teenage years and in the early twenties it is the youngest birth cohort, from mid-twenties to mid-thirties it is the middle cohort and from mid-thirties to mid-forties it is the oldest cohort.

5.2. Results from growth curve models

Table 2a and Table 2b show the results of the random effects growth curve models of lifetime fertility intentions for women and men. Models 1a & b include only the linear and quadratic terms of age. Models 2a & b show the effect of religiosity and controls on the intercept, i.e. on the level of lifetime fertility intentions. Models 3a & b include the interaction of age and religiosity, which allows statements to be made about whether the age trajectories differ for different levels of religiosity.

In a first step (not shown) we estimated a random intercept model without covariates, which allows to calculate the unconditional Intra-Class-Correlation (ICC). For women 0.73 of the variance in lifetime fertility intentions can be explained by differences between persons, rather than by change within persons. For men the ICC is 0.60, showing that within-person change explains somewhat more of the variation in lifetime fertility intentions.[5] This implies that compared to women's trajectories of lifetime fertility intentions, those of men are less determined by their initial level at teen age.

Model 1a & b in Table 2a and Table 2b include the linear and quadratic terms of age which are both significant. The linear term is positive and the quadratic term is negative which indicates a bell-shaped pattern as the descriptive results suggested. For women and men, the ICC is reduced by including age but still relatively high. 14-year-old women on average intend to have 1.886 children and men 1.805 children. The estimated standard deviations of the random intercept and slope are best interpreted by forming intervals within which 95% of the subjects are expected to lie (Rabe-Hesketh & Skrondal, 2012: 198 f). 95% of the 14-year-old women have their intercept in the range from 0.640 to 3.132 intended children (1.886 ± (1.96 *0.636)), for men the range of subject-specific intercepts is smaller (0.728 – 2.882), which reflects that women on average haver higher lifetime fertility intentions than men (see also Table 1). For women, the linear age slopes range from –0.065 – 0.097 and for men from –0.055 – 0.093. This implies that for

[5] One could expect that the ICC would be different if we used all waves from Wave 1 to Wave 9, rather than only three waves. Therefore, we also calculated the ICC for lifetime fertility intentions using annual data of the waves. The ICC was only slightly higher, confirming that our conclusions remain valid.

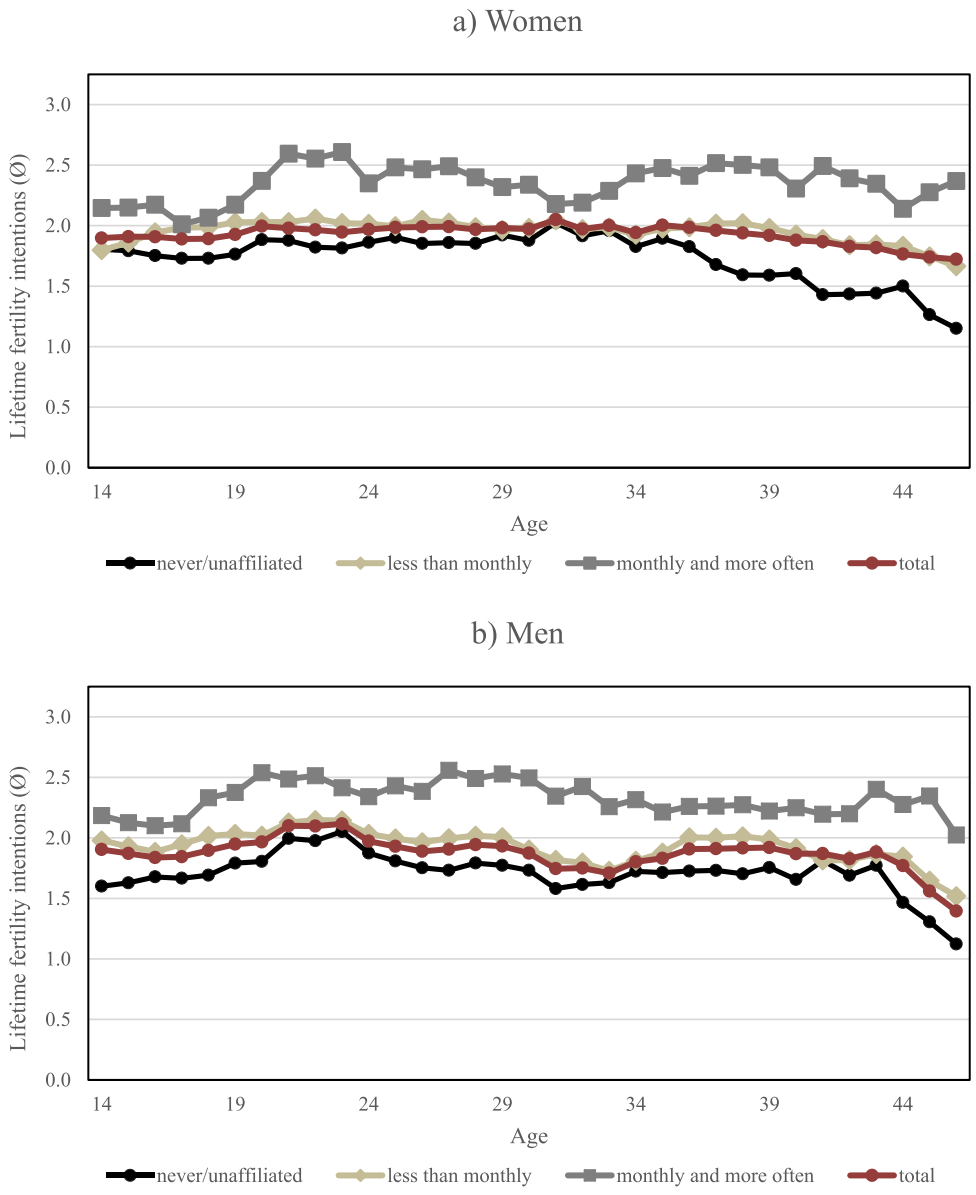

Fig. 3. Average lifetime fertility intentions by religiosity. Notes: Values represent smoothed three-year moving averages of observations per age. Data: pairfam v10.0, Waves 1, 5 & 9, own calculations.

some lifetime fertility intentions increase with increasing age while for others they decrease. This appears reasonable as due to the cohort design of pairfam each respondent contributes only to a part of the age slope.

The negative correlation between random intercepts and slopes (−0.303 for women; −0.294 for men) means that subjects with higher average lifetime fertility intentions at age 14 experience less of an increase in intentions with increasing age. Remember here that only the linear term is allowed to vary between individuals as the subject-specific observation period is short.

Models 2a & b in Table 2a and Table 2b include the main effect of religiosity and other covariates on the intercept. The level of religiosity is positively associated with lifetime fertility intentions. In comparison to the reference group of those without religious affiliation women who attend religious services at least monthly intend to have 0.278 children more on average and religious men even intend 0.301 more children.

Cohort effects only exist for men. Men from older cohorts have lower lifetime fertility intentions. Having a partner is associated with higher lifetime fertility intentions. The increase is largest for women and men who are married. Women and men who have a religious affiliation have higher lifetime fertility intentions compared to those who have none. This is true for all religious affiliations except for men affiliated to the Evangelical church. The group with the highest intentions is the summary category of other religious affiliation. There are no differences whether one is born in East or West Germany, but women and men born abroad do have higher lifetime fertility intentions. Results with regard to level of education suggest that with increasing level of education women desire less children, which is not the case for men.

Table 2a
Results from the linear random effects growth curve model for women.

	Model 1a		Model 2a		Model 3a	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
Age[a]	0.016	0.000	0.017	0.000	0.022	0.000
Age squared[a]	-0.001	0.000	-0.001	0.000	-0.001	0.000
Religiosity (ref. Never/unaffiliated)						
Less than monthly			0.080	0.000	0.144	0.000
Monthly and more often			0.278	0.000	0.311	0.000
Cohort (ref. 1991–1993)						
1981–1983			-0.037	0.265	-0.039	0.249
1971–1973			-0.058	0.201	-0.064	0.160
Relationship status (ref. No partner)						
Partner, not married			0.074	0.000	0.076	0.000
Partner, married			0.288	0.000	0.290	0.000
Missing value			0.084	0.495	0.087	0.479
Religion (ref. No denom.)						
Evang. church			0.073	0.006	0.072	0.006
Catholic Church			0.072	0.010	0.071	0.012
Other Christian			0.162	0.004	0.156	0.006
Other			0.270	0.000	0.266	0.000
Missing value			0.264	0.108	0.257	0.118
Region of origin (ref. West Ger.)						
East Germany			0.012	0.745	0.004	0.923
Abroad			0.126	0.000	0.125	0.000
Education (ref. In education)						
Low			0.145	0.000	0.143	0.000
Vocational			-0.097	0.000	-0.097	0.000
Academic			-0.107	0.001	-0.106	0.001
Missing value			-0.048	0.731	-0.043	0.757
Interaction Age & Religiosity						
Less than monthly # Age					-0.009	0.117
Monthly and more often # Age					0.003	0.719
Less than monthly # Age squared					0.000	0.216
Monthly and more often # Age squared					0.000	0.358
Constant	1.886	0.000	1.694	0.000	1.659	0.000
Random effects						
Age, standard deviation	0.041		0.041		0.041	
Constant, SD	0.636		0.636		0.615	
Correlation of age & constant	-0.303		-0.303		-0.371	
Intra-Class Correlation	0.649		0.628		0.628	
Log-Likelihood	-12665.1		-12426.8		-12423.2	
Observations	11046		11046		11046	

Data: pairfam v10.0, Waves 1, 5 & 9.
[a] Age is centred at age-14, to allow meaningful interpretation of constant term.

Table 2b
Results from the linear random effects growth curve model for men.

	Model 1b		Model 2b		Model 3b	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
Age[a]	0.019	0.000	0.028	0.000	0.028	0.000
Age squared[a]	-0.001	0.000	-0.001	0.000	-0.001	0.000
Religiosity (ref. Never/unaffiliated)						
Less than monthly			0.124	0.000	0.174	0.000
Monthly and more often			0.301	0.000	0.276	0.000
Cohort (ref. 1991–1993)						
1981–1983			-0.182	0.000	-0.182	0.000
1971–1973			-0.175	0.001	-0.181	0.000
Relationship status (ref. No partner)						
Partner, not married			0.145	0.000	0.144	0.000
Partner, married			0.379	0.000	0.379	0.000
Missing value			0.186	0.184	0.193	0.168
Religion (ref. No denom.)						
Evang. church			0.024	0.382	0.021	0.442
Catholic Church			0.064	0.028	0.061	0.036
Other Christian			0.218	0.001	0.217	0.001
Other			0.337	0.000	0.333	0.000
Missing value			0.068	0.670	0.070	0.661
Region of origin (ref. West Ger.)						
East Germany			0.026	0.474	0.020	0.591
Abroad			0.206	0.000	0.205	0.000
Education (ref. In education)						
Low			-0.005	0.887	-0.008	0.824
Vocational			0.006	0.889	0.003	0.946
Academic			-0.041	0.189	-0.042	0.174
Missing value			-0.419	0.005	-0.415	0.006
Interaction Age & Religiosity						
Less than monthly # Age					-0.003	0.632
Monthly and more often # Age					0.011	0.293
Less than monthly # Age squared					0.000	0.861
Monthly and more often # Age squared					0.000	0.197
Constant	1.805	0.000	1.601	0.000	1.589	0.000
Random effects						
Age, standard deviation	0.038		0.037		0.037	
Constant, SD	0.549		0.517		0.517	
Correlation of age & constant	-0.294		-0.385		-0.389	
Intra-Class Correlation	0.494		0.459		0.460	
Log-Likelihood	-11562.9		-11260.1		-11256.9	
Observations	9706		9706		9706	

Data: pairfam v10.0, Waves 1, 5 & 9.
[a] Age is centred at age-14, to allow meaningful interpretation of constant term.

Models 3a & b in Table 2a and Table 2b include the interaction term of religiosity and age, allowing to analyse the age trajectories of lifetime fertility intentions at each level of religiosity. A joint test of the interaction effect shows that it is not statistically significant for women and men. Model fit does not improve much. Fig. 4a shows the corresponding profile plots with predicted lifetime fertility intentions by religiosity on the y-axis. Overall, we see a bell-shaped pattern of lifetime fertility intentions. Irrespective of the level of religiosity, fertility intentions increase somewhat up to approximately age 25 and start decreasing thereafter. Highly religious women and men already have higher lifetime fertility intentions at age 14. Compared to the group with lowest religiosity, their lifetime fertility intentions are ~0.3 higher at that age. The most religious group remains on a higher trajectory across the whole age range.

5.3. Sensitivity analyses: Controlling for unobserved time-constant heterogeneity

In addition to the random effects growth curve models we also estimate fixed effects growth curve models (Allison, 2009). The fixed effects model provides within-estimates of the growth curves as they are affected by within-person change in religiosity. Effect estimates are not biased by time-constant unobserved heterogeneity. Such unobserved confounders could be indicators of the (religious) socialization in the family of origin. Consequently, the fixed effects growth curve model does not provide estimates of time-constant characteristics of subjects, whether they are observed or unobserved, such as region of origin, birth cohort or religion.[6]

Results from these additional analyses are presented in Table A1. There are some differences to the random effects growth curve models. Overall, coefficients are smaller, resulting in some effects becoming statistically insignificant. Models 1a & b show that at times when women and men attend religious services at least monthly they are significantly more likely to have higher lifetime fertility intentions compared to times when they do not attend. In contrast to the random effect model, the coefficient for less than monthly attendance is not statistically significant. The coefficients for education point in the same direction as for the random effects model. The coefficient for the highest level of education is statistically significant only at the 10% level. We kept this variable in the model because the analyses include respondents starting from age 14, but there is probably not sufficient within-variation at older ages to have a noticeable effect.

Again, the interaction of age and religiosity is not statistically

[6] Only five percent of the sample report a change of their religious affiliation.

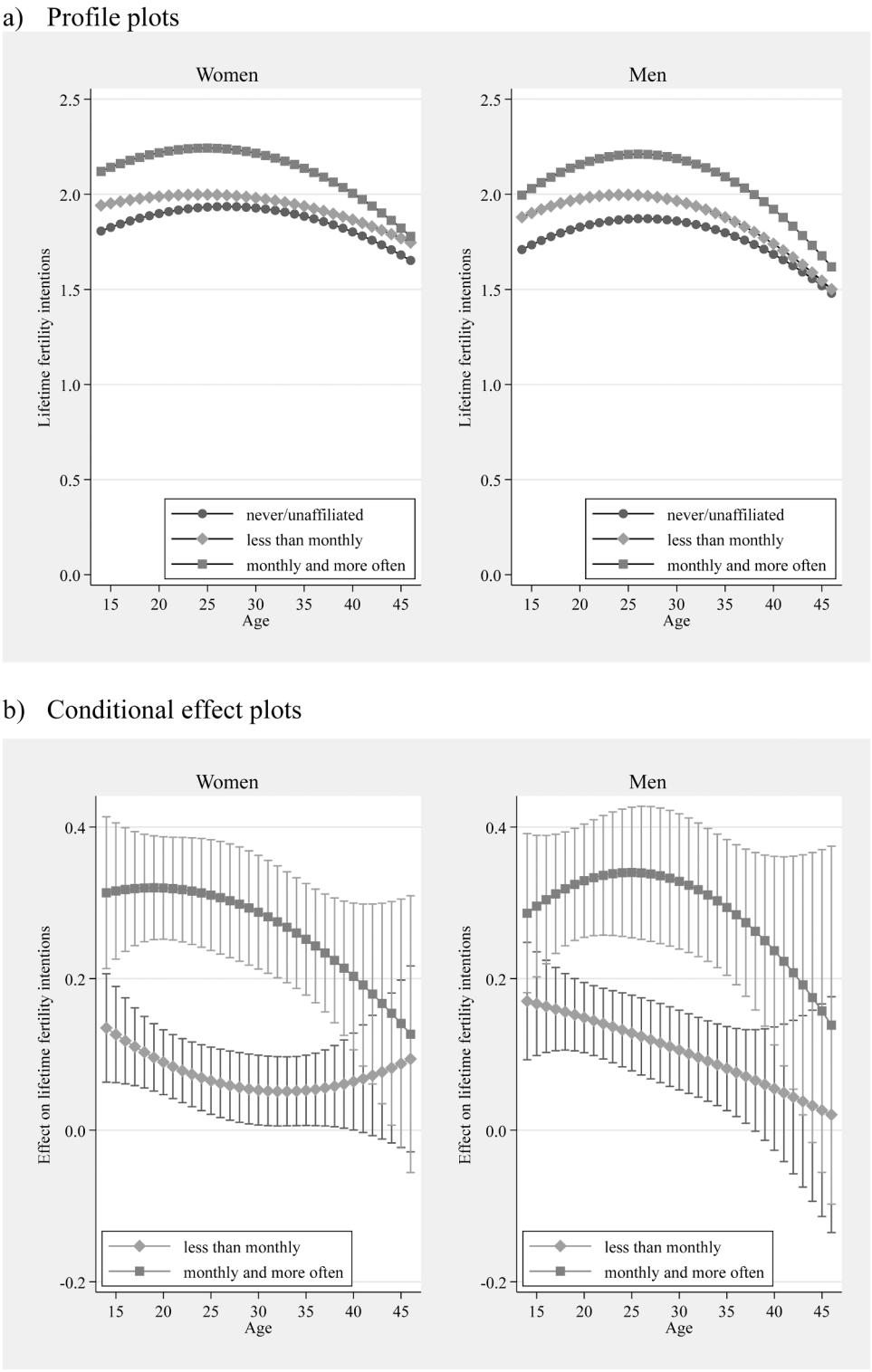

Fig. 4. Trajectories of lifetime fertility intentions by level of religiosity for the random effects growth curve model. Notes: Plots are based on Models 3a & b in Table 2a and Table 2b. Data: pairfam v10.0, Waves 1, 5 & 9.

significant (Models 2a & b). The growth curves look very much the same as for the random effects model. From these analyses in combination with the results from the random effects growth curve model, we can conclude that religiosity matters for level of lifetime fertility intentions but only for those attending religious services at least once a month. Importantly, in our study religiosity has no effect on the slope of the growth curve.

6. Summary and discussion

In this article, we investigated the relationship between religiosity and trajectories of lifetime fertility intentions over the life course. Based on our theoretical examinations, we hypothesized first that highly religious people have higher lifetime fertility intentions to begin with and second that they remain on that higher level as they get older. We tested this hypothesis in a sample of men and women aged 14–46, using data from the German family panel pairfam. To examine the trajectories of lifetime fertility intentions, we estimated random and fixed effects growth curves by level of religiosity.

Our analyses suggest that religiosity mainly contributes to explaining the starting level of fertility intentions at age 14. Compared to the less religious, highly religious women and men do have considerably higher lifetime fertility intentions to begin with. Religiosity already has a strong effect on fertility intentions in the teen-years, confirming the relevance of early religiosity and religious socialization on later fertility and childbearing (Berghammer, 2009).

The age trajectories of lifetime fertility intentions do not differ by level of religiosity. Over time, women and men across all levels of religiosity experience a decline in their intentions, although that decline happens on a higher level for those attending religious services at least once a month. We had hypothesized that religiosity would protect German women and men from experiencing a decline in fertility intentions or at least less of a decline, but this is not the case. On the contrary, the overall downward trend that has been described for Dutch women and men (Liefbroer, 2009) also holds in the German case, and it appears not to be affected by how religious people are.

Further analyses using fixed effects models largely confirm the results that were found in the random effects model with the exception that the most important difference in the level of fertility intentions lies between the group attending religious services at least monthly and those attending less than monthly or never. We conclude from this that the effect of religiosity only really comes to play at high levels of religiosity.

Overall, the results of this study confirm the importance of religiosity in childbearing plans. Previous research on this topic has mostly focused on fertility outcomes (Adserà, 2006a; Baudin, 2015; Berghammer, 2009; Peri-Rotem, 2016). A few additional studies took fertility intentions into account (Bein et al., 2017; Philipov & Berghammer, 2007) but questions about trajectories of fertility intentions have played a very minor role to date. The results of this study show that highly religious people sustain higher fertility intentions compared to the less religious over most of their reproductive timeframe. Thus, even in a highly secularized country such as Germany, we find evidence of an association of religiosity and lifetime fertility intentions. This suggests that this research strand can benefit by also analysing stability and change in fertility intentions.

This study also contributes to the expanding field of research on fertility intentions in general. Only a small number of studies on fertility intentions considered the development over time using multiple waves of panel data. While the topic of fertility intentions has already been analysed from many different angles – such as the psychological process (Miller & Pasta, 1994, 1995), cohort and country differences (Testa, 2012), family policies (Billingsley & Ferrarini, 2014), uncertainties (Morgan, 1982), education levels (Hayford, 2009) or economic uncertainty (Hanappi et al., 2017) – religiosity has often been left out in most studies. Our study was able to demonstrate that even in a rather secularised country like Germany, religiosity still contributes to understanding the formation of fertility intentions. For this reason, future studies on fertility intentions may benefit from looking at the development of lifetime fertility intentions over the life course and including aspects on religion and religiosity.

This study has some limitations. In the pairfam survey, religiosity was measured only in three waves of now 14 available waves. We focussed on these waves since there is sufficient variation to treat religiosity as a time-varying indicator. However, the within-person change remains limited. Data on religiosity could be collected yearly or at least more frequently in family panels as religiosity potentially changes even in the short term. The measure of church attendance can also be challenged for two reasons. Church attendance among Christians has been decreasing for decades, but not all of those who do not attend church consider themselves as not religious. Furthermore, for other religious groups church attendance might not be the best measurement of religiosity (see Koenig et al., 2015).

The results for Germany may be partly transferable to other countries with predominantly Christian traditions, as Germany is not so much an outlier in terms of the religiosity of its population and the trend of secularisation in comparison with other western European countries. Due to its mixed religious heritage, it provides results for both Catholics and Protestants. We found no significant differences of fertility intentions between Catholics and Protestants, contrary to what some earlier studies have found on fertility differences between these two denominations (Bujard & Scheller, 2017; Heiland et al., 2008). This adds evidence to the assumption that the traditional fertility divide between Catholics and Protestants is less relevant today. Because of the small number of cases from non-Christian denominations, this study was unable to shed light on the situation among adherents of other religions, e.g., Muslims. Therefore, a future path of research may be to investigate trajectories of fertility intentions among those groups.

All in all, this study underscores the pivotal role of religiosity in shaping fertility intentions. Religiosity affects fertility intentions across the life course but the impact is strongest during adolescence. For this reason, future studies on fertility intentions may benefit from looking at the development of lifetime fertility intentions over the life course and including aspects of religion and religiosity. Life course differentiated analyses are important to improve our understanding of the mechanisms between religiosity and the fertility decision making process. More frequent data on religiosity and additional measurements such as subjective religiosity would strengthen the analytic scope. Another potential approach in terms of methodology would be to focus on events of change of fertility intentions instead of trajectories. These future avenues of research show that this part of the fertility-religiosity nexus has only begun to be the subject of thorough investigation, and that this study may represent a first step in this direction.

Appendix

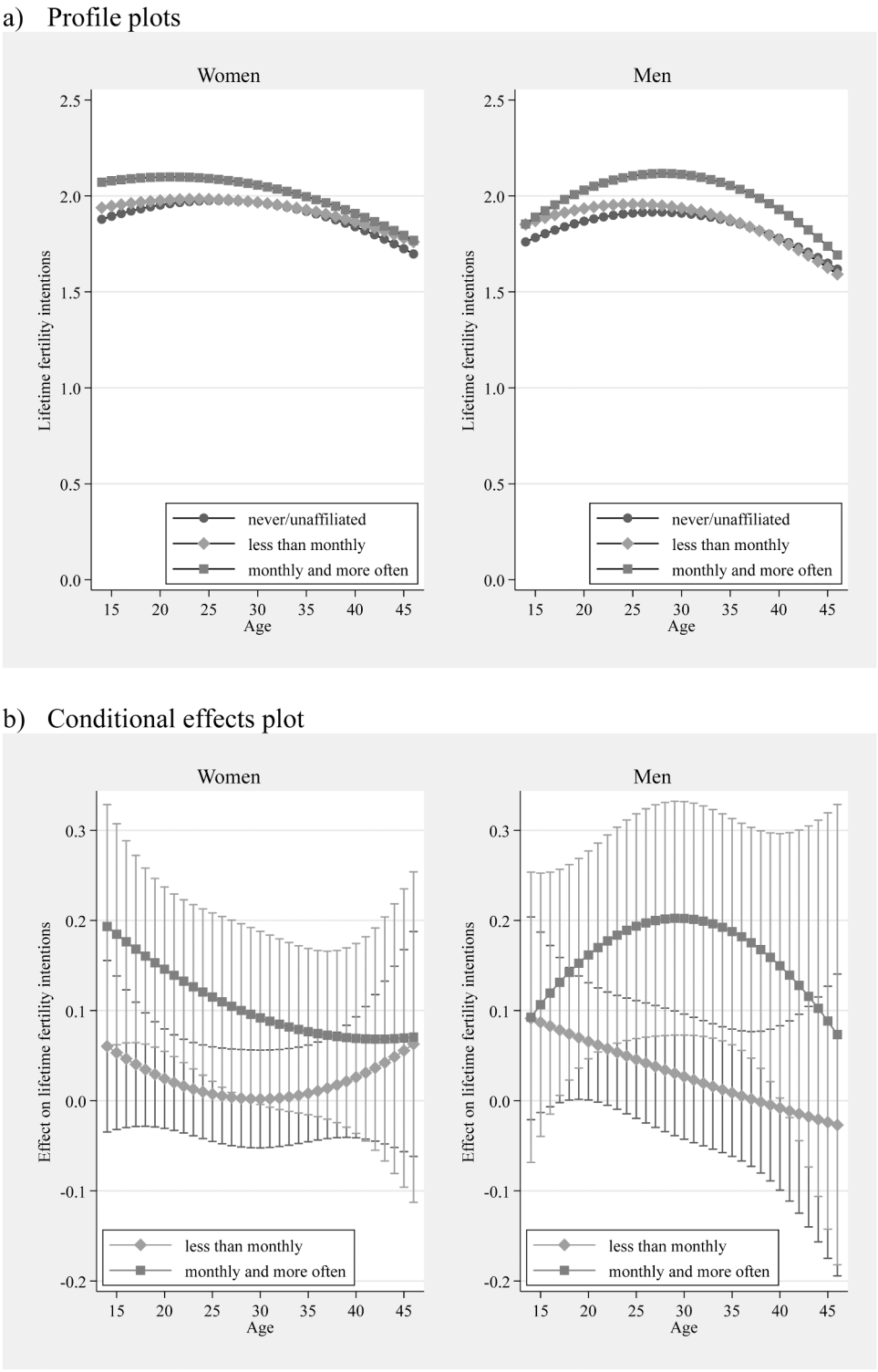

Fig. A1. Trajectories of lifetime fertility intentions by level of religiosity for the fixed effects growth curve model. Notes: Plots are based on Model 2a & b in Table A1. Data: pairfam v10.0, Waves 1, 5 & 9.

Table A1
Results from the linear fixed effects growth curve model.

	Women				Men			
	Model 1a		Model 2a		Model 1b		Model 2b	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
Age[a]	0.012	0.011	0.018	0.006	0.025	0.000	0.025	0.002
Age squared[a]	-0.001	0.000	-0.001	0.000	-0.001	0.000	-0.001	0.000
Religiosity (ref. Never/unaffiliated)								
Less than monthly	0.022	0.307	0.068	0.210	0.039	0.141	0.096	0.138
Monthly and more often	0.111	0.002	0.202	0.008	0.151	0.002	0.078	0.394
Relationship status (ref. No partner)								
Partner, not married	0.035	0.110	0.035	0.103	0.065	0.014	0.064	0.016
Partner, married	0.075	0.022	0.076	0.021	0.109	0.013	0.106	0.015
Missing value	0.134	0.420	0.135	0.416	-0.070	0.756	-0.062	0.783
Education (ref. In education)								
Low	-0.065	0.273	-0.070	0.238	0.113	0.096	0.111	0.105
Vocational	-0.021	0.511	-0.023	0.474	0.023	0.539	0.026	0.492
Academic	-0.083	0.071	-0.084	0.068	-0.081	0.178	-0.076	0.203
Missing value	-0.037	0.869	-0.030	0.893	-0.458	0.205	-0.439	0.224
Interaction Age & Religiosity								
Less than monthly # Age			-0.008	0.277			-0.004	0.623
Monthly and more often # Age			-0.009	0.380			0.015	0.255
Less than monthly # Age squared			0.000	0.283			0.000	0.938
Monthly and more often # Age squared			0.000	0.622			0.000	0.269
Constant	1.891	0.000	1.851	0.000	1.696	0.000	1.681	0.000
Sigma_u	0.892		0.893		0.841		0.841	
Sigma_e	0.486		0.486		0.567		0.567	
Rho	0.771		0.771		0.688		0.688	
Observations	11046		11046		9706		9706	

Data: pairfam v10.0, Waves 1, 5 & 9.

[a] Age is centred at age-14, to allow meaningful interpretation of constant term.

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