The relationship between religion and fertility: Evidence for Austria

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Abstract

Data from the Austrian Family and Fertility Survey are used to examine the relationship between religion and fertility in Austria. Results from a Poisson hurdle model show that both women's denominational affiliation and religiosity affect the number of children born, with more articulate gradients between women with no religious affiliation and no religious belief rather than between denominations. Unions' religious composition does not result in clear patterns, which is also the case for the effect of religion on the timing of births.

Keywords: Religion, fertility, count data, Poisson hurdle model, Austria

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1. Introduction

There is a long tradition of addressing religious affiliation as a determinant of demographic behavior. Particularly, the interest has long been focused on fertility differentials by religious denomination. Among these studies there is research with socio-historic character[1] or with focus on the US situation (e.g., Althaus, 1992; Mosher and Hendershot, 1984; Mosher et al., 1992 or Sander, 1992). These studies suggest that religions may have a variety of impacts on demographic behavior. These are on the one hand related to religious teachings and their impact on for instance entry into marriage or the use of contraception. Effects may on the other hand arise because of the social status of the particular religious body.

Recently, extensions to this branch of research were introduced inasmuch as individuals' religious affiliation and the effects of the religious composition of unions are analyzed using economic notions (Lehrer, 1996; Adsera, 2004), meaning that both quantity-quality tradeoffs and issues of marital stability play a role in the partners' bargaining processes and may thus affect fertility behavior. As partners may differ both in religious affiliation and religious belief, conflicts may for example arise over the religious upbringing of their children or over the desired number of children and the timing of births.

This paper adds threefold to the literature. First, it uses data from Austria, allowing for further transnational comparisons. This is of relevance as most European religious markets with their quasi-monopolistic or duopolistic structures are quite different to above all the US situation. Furthermore, the analyses explore fertility differentials both by females' religious affiliation, by females' religious belief and also by the partners' religious composition. Finally, in contrast to Lehrer (1996) and Adsera (2004) who both employ OLS regressions in the estimation of the number of children, this analysis employs a

[1] McQuillan (2004) extensively surveys this branch of studies.

Poisson hurdle model. This takes into account that there may be two different processes that determine either the zero births outcome or the positive births outcome. It also accounts for the discrete and non-negative character of the dependent variable.

2. Characteristics, bargaining and marital stability

The analyses in this paper rely on two strands of theoretical arguments. It first is of relevance as to why individuals' religious affiliation and religious belief may affect their behavior at all and to what extent differences between religions may therefore emerge. Second, the religious composition of unions also plays a role as inner-partnership processes may also affect individual demographic behavior.

With respect to the first theoretic notion, the early approaches that studied fertility differentials basically follow two lines of arguments (Goldscheider, 1971).[2] The first approach, the so-called "characteristics approach", argues for spurious fertility differences because of differences in individual characteristics. The "particularized theology" hypothesis however suggests that differences in religious values and teachings result in fertility differences that persist after taking into account individuals' characteristics and the socio-economic profiles of religious groups. Differences in religious values across denominations exist for example with regard to birth control and attitudes towards abortion.

Goldscheider (1971, 1999) extends these lines of arguments and suggests that both total content and social status of the respective religious body are as important as other broadly based norms of gender relationships and family control. Accordingly, the social status may be particularly relevant for shaping demographic patterns of religious minority groups.

[2] McQuillan (2004) summarizes Goldscheider's work and discusses the sources of religious influence in detail for Christianity and, less detailed, also for Islam and Asian religions.

Furthermore, in addition to norms and rules that may directly affect individual behavior, there are other indirect effects because of broader socio-cultural aspects associated with religious faiths. For example, norms on the entry into sexual unions, the acceptance of sexual activity outside of unions or issues of sexuality within marriages all have the potential to affect fertility behavior.[3] There moreover are religious groups such as Mormons or Catholics that endorse (strong) pronatalist ideologies.

The second strand of arguments is based on economic theory (Lehrer, 1996). As noted above, differences in religious beliefs between spouses may raise the possibility of conflict over fertility decisions, i.e. the number and timing of births which may then be resolved by bargaining mechanisms (Lundberg and Pollak, 1993). This "bargaining effect" suggests for both positive and negative effects on fertility, depending on the union's religious composition and the bargaining power of the partners. In particular, spouses who both belong to the same pronatalist religious group should ceteris paribus have a higher fertility compared to a union with only one member of this group. Similarly, if a union is affiliated to a religious group which is not specifically pronatalist, the union's fertility should ceteris paribus be lower compared to another union where only one of the two partners belongs is affiliated to the pronatalist group.

There is a second economic channel suggesting for fertility differences between intra-faith and inter-faith unions. The so-called "marital stability effect" is attributed to the work of Becker et al. (1977). They argue that inter-faith couples are exposed to a higher risk of union dissolution because of, among other issues, conflicts over fertility decisions. Insofar as partners and particularly women recognize the instability of such a union, they have an incentive to maker fewer investments in spouse-specific human capital, meaning that they

[3] There is also evidence that differences between religions and denominations in attitudes towards appropriate gender roles affect women's labor market behavior (Lehrer, 1995; Heineck, 2004).

are less likely to have children. In contrast, women have an incentive to invest in labor market related human capital that becomes valuable in the case of divorce. This "marital stability effect" therefore implies that inter-faith couples will have a lower fertility because of the shorter expected duration of such a union and because of restricted fertility behavior while these unions are still intact.

As mentioned above, there is a large body of relevant demographic literature. McQuillan (2004) provides a survey of relevant studies which are not summarized in this paper to save space. Apart from that there are to the best knowledge only two prior studies that examine both the fertility effects of individuals' religious affiliation and the impact of unions' religious composition from an economic point of view. Lehrer (1996) examines data from 1987-88 National Survey of Families and Households (NSFH). Her results underline the importance of taking the husband's or male partner's religious affiliation into account. One the one hand, she finds significant differences between religious affiliations. In particular, Mormons and Catholics have higher predicted family size than (ecumenical or exclusivist) Protestants or individuals without religious affiliation. On the other hand, her analyses indicate substantial fertility differentials for inter-faith unions in which the woman is either Catholic or Mormon. While a homogamous Catholic union for example has a predicted family size with 2.5 children, unions where the man has a different religious affiliation have 2.2 children, and there are 2.0 children in unions where the man has no religion. Similarly, predicted family size for Mormons decreases from about 3.3 in homogamous unions to about 2.5 children if the husband either has a different or no religion. Additional models that explore the effects of religious conversion and religiosity show that there also is a small Catholic-Protestant differential.

Adsera (2004) uses data from the 1985 and 1999 Spanish Fertility Surveys und analyzes the relationship between religion and fertility behavior, i.e. family size and timing of

births. Her findings first suggest that similar to other European countries and despite being a Catholic bastion, Spain has experienced substantial decreases both in church attendance rates and total fertility rates. Her results however imply a better sorting among Spanish Catholics over time inasmuch as practicing Catholics in 1999 have significantly higher fertility whereas there are no significant differences in family size among practicing and non-practicing Catholics in 1985.[4] She furthermore estimates Cox proportional hazard models to analyze the impact of religion on the transitions to the first three births. She finds that the spacing of the second birth is not different across homogamous and heterogamous groups. Yet, her results suggest that practicing Catholics have faster within-marriage transitions to the birth of both the first and the third child. There furthermore is a remarkable slow progression among inter-faith unions, particularly among those with non-Catholic husbands.

The theoretical reasoning as well as the empirical findings by Lehrer (1996) and Adsera (2004) provides testable hypotheses for the subsequent analyses. 1) Family size may be expected to be higher for Catholic females compared to women with other religion and in particular compared to those with no religion. 2) Compared to homogamous Catholic unions, inter-faith couples are expected to have lower fertility. 3) Similar effects might be expected for the impact of religious belief, depending on whether the female or the male is the religious partner. 4) In addition, broadly the same picture should show with respect to the effects of religion on the timing of births: Individuals with pronatalist religious ideology should have higher progression rates, mainly for the transitions to the first and the third child.

[4] There however is a statistically significant difference between non-practicing Catholics and females with no religion. The predicted number of children is 3.9 and 3.7 respectively.

3. Data and methods

The data used in this analysis are drawn from the Family and Fertility Survey (FFS). This survey covers 24 countries which have been conducted in the 1990s in selected member states of the United Nations Economic Commission for Europe (UNECE).[5] The FFS provides a wide range of information on individuals' life cycle events, including retrospective histories on partnerships, birth histories, and employment. Furthermore, indicators on both the respondent's and the partner's religious involvement are available. However, while the use of the full range of countries participating in the survey would be interesting, the harmonized data do only partially provide information on individuals' religious affiliation. This analysis therefore explores the Austrian sample only. This sample was surveyed between December 1995 and May 1996, covered about 6.000 individuals, aged 20 to 54 years old, and is representative both on a national level and a federal level.

The sample is restricted to females in first unions, in order to allow for comparisons to prior analyses (Lehrer 1996; Adsera 2004), and excludes observations with missing values in relevant variables. The final sample used includes 2,490 observations for the analyses on the number of children born. As for the timing of births, there is complete information on 2,172 first births, 1,558 second births and 513 third births.[6] The FFS provides information on the union's start of living together and the time of marriage. However, as the focus of the analyses is not on marital but first union's fertility, the dependent variable in the regressions on the timing of first birth is the hazard of giving birth after age 15 with the duration given in months. Spacing of second and third births is also given in months

[5] For more information, see http://www.unece.org/pau/ffs/ffs.htm.

[6] There are only few observations on stillbirths and twins that are excluded from the analyses.

indicating the duration either between the first and the second or between the second and the third birth.

The central regressors are indicators on individuals' religious involvement. In the Austrian FFS, information on religion is given for respondents' current religious affiliation and belief. In addition, there are indicators on the partner's religion which allows for analyzing fertility behavior of both intra-faith and inter-faith couples.

While the availability of information on the religious affiliation of both the respondent and her partner is an advantage of the FFS data compared to other surveys, analyses on differentials between denominations are limited, because Austria is a Catholic country: 84% of the women in the sample are Catholic (see the descriptive statistics in the Appendix). Since 1) the Protestant category in the sample quite likely includes both mainstream and fundamentalist groups and 2) being a member of any other religious group also comprises religious institutions that may differ widely in their attitudes towards fertility, the results on denominational differences below should be interpreted keeping this in mind.

The following set of control variables is included in the regressions on the number of births: the duration of the union, whether the women was born in 1960 or later, whether the woman's mother had more than 2 children, whether the partners are cohabiting, both the woman's and her partner's education, whether the household's net income is below the median income class or above, the federal state and the size of the residence, the woman lives in at the time of the survey as well as the size of the residence, the woman lived in at age 15.

All above mentioned covariates except of the duration of the union are also included in the analyses of the timing of births. The regressions on the timing of the second birth further controls for age at first birth and whether the first child is male; the latter as well as the

duration between first and second birth and a dummy indicating whether the first two children are male are included in the analyses on the timing of the third birth.[7]

The following methods are used in the analyses below. First, in contrast to Lehrer (1996) and Adsera (2004) who employ OLS, a Poisson hurdle model is employed to examine the effects of religion on the number of births. The Poisson hurdle model is more appropriate than OLS: it accounts for 1) two possible underlying processes that lead to either zeros or positive outcomes and 2) the discrete nature of the dependent variable.[8] The "… idea underlying the hurdle formulations is that a binomial probability model governs the binary outcome of whether a count variate has a zero or a positive realization. If the realization is positive, the "hurdle is crossed", and the conditional distribution of the positives is governed by a truncated-at-zero count data model", (Mullahy, 1986, p. 342).

Therefore, starting with the binomial process on whether the dependent variable takes on the value zero or positive outcomes, the probability mass function is

$$\Pr(Y = y) = \begin{cases} \pi, & y = 0 \\ 1-\pi, & y = 1,2,3,... \end{cases} \tag{3.1}$$

The probability mass function of the zero-truncated Poisson process is

$$\Pr(Y = y \mid Y \neq 0) = \begin{cases} \dfrac{\lambda^y}{(e^\lambda - 1)y!}, & y = 1,2,3,... \\ 0 & \text{otherwise} \end{cases} \tag{3.2}$$

Therefore, the unconditional probability mass function for *Y* is

[7] The results for the controls are not discussed to save space but are available upon request.

[8] Melkersson and Rooth (2000) propose a zero-and-two inflated count data model to analyze completed fertility. While it would be interesting to replicate their analysis, sample size restrictions inhibit this approach. Therefore, the 'single' hurdle model is employed here, as fertility may not be completed for the younger cohorts in the sample.

$$\Pr(Y=y)=\begin{cases}\pi, & y=0\\ (1-\pi)\dfrac{\lambda^{y}}{(e^{\lambda}-1)y!} & y=1,2,3,...\end{cases} \tag{3.3}$$

Assuming that the observations are IID, the log likelihood for the t^{th} observation is

$$\ln L(\pi_i,\lambda_i,y_i)=\begin{cases}\ln\pi_i, & y=0\\ \ln\left\{(1-\pi_i)\dfrac{\lambda_i^{\,y_i}}{(e^{\lambda_i}-1)y_i!}\right\} & y=1,2,3,...\end{cases} \tag{3.4}$$

Using the complementary log-log link to model π_i and the log link to model λ_i, so that $\pi_i=e^{-e^{x_i\beta_1}}$ and $\lambda_i=e^{x_i\beta_2}$, the log likelihood can be written as

$$\ln L=\ln\left\{\prod_{i\in\Omega_0}\left(e^{-e^{x_i\beta_1}}\right)\prod_{i\in\Omega_1}\left(1-e^{-e^{x_i\beta_1}}\right)\prod_{i\in\Omega_1}\frac{e^{y_i x_i\beta_2}}{\left(e^{e^{x_i\beta_2}}-1\right)y_i!}\right\}$$

$$=\ln\left\{\sum_{i\in\Omega_0}-e^{x_i\beta_1}+\sum_{i\in\Omega_1}\ln\left(1-e^{-e^{x_i\beta_1}}\right)\right\}+\left\{\sum_{i\in\Omega_1}y_i x_i\beta_2-\sum_{i\in\Omega_1}\ln\left(e^{e^{x_i\beta_2}}-1\right)-\sum_{i\in\Omega_1}\ln\left(y_i!\right)\right\}$$

$$=\ln\left\{L_1\left(\beta_1\right)\right\}+\ln\left\{L_2\left(\beta_2\right)\right\} \tag{3.5}$$

where $\Omega_0=\{i\mid y_i=0\}$, $\Omega_1=\{i\mid y_i\neq 0\}$ and $\Omega_0\cup\Omega_1=\{1,2,...,N\}$.

That is, the log likelihood is the sum of the log likelihood from the binomial probability model, $\ln L_1\left(\beta_1\right)$, and the log likelihood of the truncated-at-zero count model, $\ln L_2\left(\beta_2\right)$. Without loss of information, the hurdle model can therefore be maximized by maximizing the two components separately. Here, the hurdle model is estimated employing a Probit model and a truncated-at-zero Poisson model. To ease interpretation (Long, 1997), discrete changes are calculated following the Probit models and factor changes are calculated following the truncated count data models.

The timing of births is then analyzed using Cox proportional hazard models (Greene, 2003):

$$\lambda(t_i) = \lambda_o(t_i)\exp(x_i'\beta), \qquad (3.6)$$

where i=1, …, N are women who each enter a state, i.e. the time of the first, second or third birth, at time t=0. $\lambda_o(t_i)$ is the non-parametric baseline hazard, representing individual heterogeneity.

In both models, the Poisson hurdle model as well the Cox proportional hazard model, x_i is the vector of covariates that also includes individuals' religious affiliation, their belief and the union's religious composition.

4. Results

Providing a first descriptive impression, Figure 1 shows the distribution of the number of children by intra- and inter-faith partnerships.[9] While the majority has two children irrespective of the partners' denominational composition, inter-faith couples are more likely to have no children and are less likely to have more than 2 children.

(Figure 1 about here)

Looking at denominational affiliation and religious belief in more detail, Table 1 indicates that individuals with religion on average have some 0.5 children more than individuals without religious affiliation: Catholics, Protestants and individuals with other religion have about 1.7 children whereas individuals with no religion have 1.2 children. While the distributions do not show large differences between patterns for Catholics, Protestants and females with other religion, note again that Protestants and other religious groups might comprise heterogeneous groups, and that sample size for each group is limited.

However, contrasting Catholic women and women without denominational affiliation, there are clear differences in the distributions. Catholic women are only half as likely as

[9] The distributions are restricted to a maximum of five children as there are no inter-faith partnerships with more than 5 children and only a few homogamous unions with up to 8 children.

women with no religion to have zero births and more than twice as likely to have three or more children. Furthermore, with a test statistic of 134.48, a Chi^2-test strongly indicates rejection of the assumption of independence between religious affiliation and the number of children.

(Table 1 about here)

Differentiating by individuals' religious belief, the findings in the lower panel of Table 1 suggest for even stronger patterns in the relationship between religiosity and birth outcomes. On average, there is a monotonic decline in the number of births by religious belief: On the one side of the spectrum, individuals with a strong religious belief have almost 2.1 children, while the average number of children decreases to some 1.2 children for women without religious belief. This monotonic gradient is further visible in the distributions except for those with two children and it culminates in the finding for women with strong religious belief ('rather yes') who are more than 10 times as likely to have four or more children compared to women for whom religion does not play a role at all ('certainly not'). Unsurprisingly, a Chi^2-test statistic of 43.51 suggests for rejection of the assumption of independence between religious belief and the number of children.

4.1 Family size by religion

The results from the hurdle models are provided in Table 2 and Table 3 where Table 2 presents evidence for the relationship between women's religious involvement and birth outcomes; Table 3 provides the results for the models that include unions' religious composition.

With regard to women's religious affiliation, the regressions suggest that Protestant women and those with other religious affiliation do not statistically differ from Catholics both in the likelihood of giving birth at all and in the number of children born (Table 2,

model 1). This is at odds with a priori expectations, but might well be because of the possible heterogeneity within the two groups. The evidence for women without religion is in line with theoretical reasoning inasmuch as they are both less likely to have children at all and, given a positive outcome, to have significantly fewer children: The Probit model suggests that the predicted probability of having children decreases by about 0.9 for women with no religion and, statistically weaker though, that the expected number of children born decreases by about 16 per cent.

As for religious belief, the binary model estimates do not suggest for differences in the likelihood of having children born (Table 2, model 2). However, compared to women who have a less distinct religious belief, a strong religious belief is positively related to the number of children, while having no belief at all is negatively associated with family size, where the expected number of children increases or decreases by about 20 per cent respectively.

(Table 2 about here)

Interacting females' religious affiliation with strong religious belief,[10] the probit model reinforces that women without religious affiliation are less likely to have children, irrespective of the women's religious belief. Furthermore, women without strong religious belief have fewer expected children compared to Catholic believers, with factor changes of 0.8 and 0.7 respectively.

As for the unions' religious composition, the results in Table 3 reinforce the descriptive impression above and show that compared to homogamous unions, the predicted probability of having children decreases by 0.3 for heterogamous unions (Table 3, model

[10] The remaining response categories 'yes, somewhat', 'rather not' and 'no, not at all' are collapsed into 'no strong belief' category. Collapsing 'yes, very' and 'yes, somewhat' into a 'believer' category do not result in substantially different findings and are therefore not presented.

1). Given that the coefficient is statistically significant on the 10 percent level only and that the predicted number of births of heterogamous unions is not statistically different from that of intra-faith unions, one might be tempted to conclude that the religious composition of unions does not make a difference. However, further differentiating by individuals' religious affiliation (Table 3, model 2) there is support for both the 'marital stability effect' and the 'bargaining effect' inasmuch as the likelihood of having children is lower for unions in which the partners have different religious affiliations. In particular, the predicted probability of having children decreases by about 0.05 for Catholic women whose husbands have no religion and by about 0.15 if the husband is Catholic, but his wife does not belong to any religious group or church. In line with the gradient found above, the predicted probability of having children decreases by 0.8 for unions in which both partners have no religious affiliation. While all these findings are also accompanied by factor changes that point to a lower number of children born to these couples, the estimates of the truncated Poisson model however are not statistically significant.

(Table 3 about here)

With regard to the religious belief composition of the union, there is no evidence for negative effects on the likelihood of having children for unions other than the reference category, i.e. for unions in which both partners are strong religious believers. While all coefficients point to a negative relationship, none of them is statistically different from zero. However, while the first step in the hurdle model does not convincingly support a priori reasoning, the results from the count data model reinforce expectations inasmuch as unions in which either both partners or only the male partner has no strong religious belief have fewer children. Compared to the reference category of a homogamous 'strong religious believer' union, the expected numbers of births decrease by a factor of about 0.8 (Table 3, model 3).

Without showing it in detail, predictions of the number of children[11] are in line with the patterns shown above: While there are only negligible differences in predicted family sizes between denominations, individuals with no religion have fewer children (1.3 compared to some 1.6). The gradient is more distinct by religious belief inasmuch as women with strong religious belief have some 1.8 children compared to 1.2 children found for women with no religious belief at all. This finding holds for unions' religious composition as well: If both partners have a strong belief, the predicted number of children is 1.9; if, on the other hand, both partners do not have a strong belief, predictions yield a family size of 1.5. In sum, the above presented findings suggest that religion as measured by affiliation and belief are related to the number of children born in Austria, with more articulate gradients between women with no religious affiliation and no religious belief rather than between denominations.

4.2 Transitions to first, second and third birth

Figure 2 shows Kaplan-Meier estimates of the transitions to first, second and third births for homogamous and heterogamous unions. At first glance, there seems to be differences in the spacing of the first and the third birth suggesting that heterogamous couples postpone the respective childbearing decision. However, for the transition to third births, the 95 percent confidence interval band of the survival function of heterogamous unions completely overlays the survival function of homogamous couples, so that there is no statistically significant difference between the two groups. As for the transition to first birth, the lower limit of the 95 per cent confidence interval band of the survival function of

[11] Predictions were calculated based on both OLS und hurdle models. Differences between the predictions were small with OLS predictions somewhat overestimating observed values and predictions from the hurdle models slightly underestimating observed values.

heterogamous unions is tangent to most of the survival function of homogamous couples so that there too is no convincing statistical difference between the two groups.

(Figure 2 about here)

As these graphs are based on nonparametric estimates that do not account for confounding factors, Cox proportional hazard models are conducted including the set of controls as introduced above. Table 4 provides the regression results for the transitions to first, second and third birth for females' religious involvement and Table 5 presents the results for unions' religious composition.[12]

The results from the regressions suggest for mainly no effects of females' religious affiliation and belief on the transition to first birth (Table 4, columns 1, 4, and 7) with two exceptions that are in contrast to prior expectations. In particular, either being a woman with rather no religious belief or having no affiliation and no religious belief yield a slightly faster transition to first birth compared to believers or Catholic believers respectively. However, the changes in the estimated hazard ratio of about 1.1 and 1.3 respectively are rather small. The transition to the second birth too is not strongly associated to females' religion: The hazard ratio for women with strong religious belief changes by about 1.2, again suggesting for a small effect; being a Catholic with no particularly strong religious belief results in a slower transition to second birth, with a factor change of about 0.8

(Table 4 about here)

Surprisingly, the largest effects show for the transition to third births. However, while a priori expectations would suggest for faster transitions to third births among Catholics, the estimation results imply that females of other or no religious affiliation have a shorter duration between the birth of the second and the third birth. The estimated hazard ratios

[12] Again, only the religion covariates are discussed. Full estimation results are available upon request.

change by 1.9 and by 2.1 (Table 4, column 3). The findings for religious belief also suggest for heterogeneous patterns, with factor changes of 1.2 for women with strong religious belief, but also for women with rather no belief. The model specification including the interaction terms also hint towards some kind of 'duality': there are changes in hazard ratios of 2.1 for strong believers of other than Catholic affiliation and of 2.0 for individuals with no religious affiliation and no strong belief (Table 4, column 9). It cannot be easily answered what causes are behind these results that are at odds with theoretical reasoning. On the one hand, it may well be that the 'other religious affiliation' category comprises a variety of heterogeneous religious groups that have a stronger pronatalist ideology than the Catholic Church. However, Protestants make for the biggest part of this group and there for example are only few Muslims whose fertility norms may exceed the Catholic norms. Furthermore, there is no quick explanation for the positive transition effect of having no religion at all, even more so as the results from the Hurdle model regressions suggest for smaller family sizes. Further research should address this puzzle in more detail, possibly with other and larger datasets.

As for the relationship between unions' religious composition and the transition to births, the results from the Cox proportional hazard models indicate that heterogamy in the broadest sense does neither fasten nor slow down the transition rates (Table 5, columns 1 to 3). Further differentiating partners' religious affiliation, the regression results suggest for mainly no effects of the religious composition of the partners on the transition to either first or second birth except for unions where both partners have no strong religious belief. The factor change of 0.7 implies a slower transition to second birth. There however seems to be more of a relationship between religious union composition and transitions to third births. In particular, there is evidence that homogamous unions of other or no religious

affiliation have higher transition rates than homogamous Catholic partnerships,[13] with the transition rates changing by about 1.9 and 2.0 (Table 5, column 6).

(Table 5 about here)

Finally, compared to unions in which both partners are strong religious believers, 'non-believer' unions have a lower transition to third birth, with a factor change of 0.7, wich is similar to the factor change for the transition to second birth as shown above.

5. Concluding remarks

This paper studies the relationship between individuals' religious involvement, unions' religious composition and fertility of first unions' in Austria. Theoretical reasoning and previous research suggests that religions may exert both direct and indirect influence on individuals' fertility behavior. Differing fertility norms between religions may for example have a direct impact on contraception or abortion. Furthermore, indirect effects on fertility behavior may arise because of the religions' ideology with regard to for instance gender role attitudes.

In addition to females' own religious affiliation and belief, the religious composition of unions has to be taken into account as well. This is because there may be a higher potential for conflicts over fertility decisions within unions in which the partners do not share the same religion.

The empirical part of the paper analyzes the effect of individuals' religion on both the number of children born to first unions and the spacing of the first three births. Results from Poisson hurdle models suggest for differences in predicted family size between

[13] It however has to be noted that unions in which the woman has no religion and the partner has any other religious affiliation are dropped from the regressions because of multicollinearity problems. The reference category therefore is somewhat heterogeneous.

Catholic women on the one hand and women with no religion on the other hand. Even larger differences show for strong religious believers compared to females who have no religious belief. Less consistent and weaker effects are found for heterogamous religious unions.

As for the timing of births, there is no evidence for a clear pattern for an effect of religion. There furthermore are results that are at odds with prior expectations. In particular, individuals with other or no religious affiliation have faster transitions to the third birth compared to Catholics. This is puzzling as the estimations on family size imply a smaller number of children born in the first place.

As for future research, there are several ideas arising from this analysis. First, it may be worth addressing the latter phenomenon in more detail by for example examining the desired number of children by individuals' religion. This might help to understand whether the prior reasoning of pronatalist Catholic ideology will hold or not hold for the Austrian case, which may cause the somewhat unexpected findings here.

Furthermore, it might be worthwhile to conduct analyses with more recent data to explore whether the relationship found for the mid of the 1990s still holds or whether, in contrast, secularization has further eroded the already low Austrian fertility rate.

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Appendix: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Number of children born	1.794	(1.105)	0	8
Duration to first birth after age 15 in months[+]	101.346	(47.382)	5	310
Duration to second birth in months[++]	39.865	(28.401)	5	226
Duration to third birth in months [+++]	53.200	(39.625)	5	228
R: Catholic	0.841	(0.365)	0	1
R: Protestant	0.062	(0.241)	0	1
R: Has other religious affiliation	0.036	(0.186)	0	1
R: Has no religious affiliation	0.060	(0.237)	0	1
R believes: Certainly yes	0.122	(0.327)	0	1
R believes: Rather yes	0.583	(0.493)	0	1
R believes: Rather not	0.217	(0.412)	0	1
R believes: Certainly not	0.077	(0.266)	0	1
R: Catholic and strong belief	0.093	(0.290)	0	1
R: Other religious affiliation and strong belief	0.022	(0.147)	0	1
R: No religious affiliation and strong belief	0.006	(0.082)	0	1
R: Catholic and no strong belief	0.748	(0.434)	0	1
R: Other religious affiliation and no strong belief	0.076	(0.265)	0	1
R: No religious affiliation and no strong belief	0.053	(0.224)	0	1
Interfaith/Heterogamous union	0.157	(0.363)	0	1
R: Catholic; P: Catholic	0.752	(0.431)	0	1
R: Catholic; P: Other religious affiliation	0.036	(0.188)	0	1
R: Catholic; P: No religious affiliation	0.052	(0.222)	0	1
R: Other relig. affiliation; P: Other relig. affiliation	0.046	(0.211)	0	1
R: Other religious affiliation; P: Catholic	0.043	(0.204)	0	1
R: Other relig. affiliation; P: No relig. affiliation	0.007	(0.087)	0	1
R: No relig. affiliation; P: No relig. affiliation	0.043	(0.204)	0	1
R: No relig. affiliation; P: Catholic	0.013	(0.116)	0	1
R: No relig. affiliation; P: Other relig. affiliation	0.002	(0.052)	0	1
R: Strong belief; P: Strong belief	0.064	(0.245)	0	1
R: No Strong belief; P: No Strong belief	0.849	(0.357)	0	1
R: Strong belief; P: No Strong belief	0.057	(0.233)	0	1
R: No Strong belief; P: Strong belief	0.028	(0.165)	0	1
Age at first birth in months[+]	281.346	(47.382)	185	490
First birth was male[+]	0.514	(0.499)	0	1
First and second births were male[+++]	0.257	(0.437)	0	1
Duration of marriage: 0-2 years	0.064	(0.245)	0	1
Duration of marriage: 3-4 years	0.038	(0.191)	0	1
Duration of marriage: 5-6 years	0.042	(0.202)	0	1
Duration of marriage: 7-8 years	0.038	(0.192)	0	1
Duration of marriage: 9-10 years	0.038	(0.192)	0	1
Duration of marriage: 11-12 years	0.033	(0.179)	0	1
Duration of marriage: 13-14 years	0.038	(0.191)	0	1
Duration of marriage: 15 and more years	0.461	(0.498)	0	1
Born 1960 or later	0.512	(0.499)	0	1
Marital status other than married	0.134	(0.341)	0	1
R's mother had more than two children	0.661	(0.473)	0	1
Net-household income below average income	0.310	(0.462)	0	1
Net-household income above average income	0.265	(0.441)	0	1
R's Education: 0	0.301	(0.459)	0	1
R's Education: 1	0.540	(0.498)	0	1
R's Education: 2	0.085	(0.279)	0	1
R's Education: 3	0.071	(0.257)	0	1

P's Education: 0	0.120	(0.325)	0	1
P's Education: 1	0.636	(0.481)	0	1
P's Education: 2	0.143	(0.350)	0	1
P's Education: 3	0.099	(0.299)	0	1
Federal state: Vienna	0.120	(0.325)	0	1
Federal state: Lower Austria	0.134	(0.340)	0	1
Federal state: Burgenland	0.089	(0.285)	0	1
Federal state: Styria	0.130	(0.336)	0	1
Federal state: Carinthia	0.096	(0.295)	0	1
Federal state: Upper Austria	0.124	(0.329)	0	1
Federal state: Salzburg	0.106	(0.308)	0	1
Federal state: Tirol	0.115	(0.319)	0	1
Federal state: Vorarlberg	0.083	(0.276)	0	1
Size of residence: 0-5.000	0.488	(0.499)	0	1
Size of residence: 5.001 - 50.000	0.263	(0.440)	0	1
Size of residence: 50.001 - 1.000.000	0.128	(0.334)	0	1
Size of residence: Vienna	0.120	(0.325)	0	1
Size of residence at age 15: 0-5.000	0.561	(0.496)	0	1
Size of residence at age 15: 5.001 - 50.000	0.237	(0.425)	0	1
Size of residence at age 15: 50.001 - 1.000.000	0.099	(0.299)	0	1
Size of residence at age 15: Vienna	0.089	(0.285))	0	1

Notes: R – Respondent; P – Partner; N=2490; $^{+}$ N=2170; $^{++}$ N=1558; $^{+++}$ N=513.

Source: Austrian FFS, 1996.

Table 1: Distribution of number of children by religious affiliation and religious belief

Number of children	in %					Average
	0	1	2	3	4+	
Catholic	16.3	24.2	39.7	14.8	5.0	1.70
Protestant	22.3	17.6	39.6	15.4	5.1	1.68
Other religion	17.2	22.3	42.6	11.1	6.8	1.69
No religion	31.2	29.3	31.9	5.8	1.8	1.18
R believes: Certainly yes	12.0	16.2	37.2	21.8	12.8	2.07
R believes: Rather yes	14.5	23.1	43.1	14.6	4.7	1.72
R believes: Rather not	26.0	27.2	33.8	10.6	2.4	1.36
R believes: Certainly not	25.7	34.7	30.8	7.7	1.1	1.24
All	17.7	24.2	39.3	14.0	4.9	1.64

Notes: LR-Test of independence between number of children and religious affiliation or belief: Chi^2-values of 134.48 and 43.51 with df=12 and Prob > 0.000 for religious affiliation and belief, respectively.

Source: Austrian FFS 1996. Own calculations, weighted

Table 2: Respondent's religious involvement and birth outcomes; Hurdle model estimates

	(1) Probit	Truncated Poisson	(2) Probit	Truncated Poisson	(3) Probit	Truncated Poisson
R: Protestant	0.005	1.046	–	–	–	–
	(0.023)	(0.085)				
R: Other religion	-0.040	1.000	–	–	–	–
	(0.045)	(0.121)				
R: No religion	-0.089***	0.840*	–	–	–	–
	(0.033)	(0.086)				
R believes: Certainly yes	–	–	0.005	1.176***	–	–
			(0.019)	(0.063)		
R believes: Rather not	–	–	0.005	0.947	–	–
			(0.014)	(0.050)		
R believes: Certainly not	–	–	-0.004	0.803**	–	–
			(0.020)	(0.076)		
R: Other religion*strong belief	–	–	–	–	-0.039	1.093
					(0.059)	(0.137)
R: No religion*strong belief	–	–	–	–	-0.226*	0.757
					(0.130)	(0.206)
R: Catholic*no strong belief	–	–	–	–	-0.017	0.840***
					(0.021)	(0.048)
R: Other relig.*no strong belief	–	–	–	–	-0.023	0.826**
					(0.035)	(0.077)
R: No religion*no strong belief	–	–	–	–	-0.105**	0.718***
					(0.052)	(0.087)
Chi^2	616.48	309.00	605.32	324.12	616.01	317.95
Log likelihood	-642.97	-2,686.80	-648.54	-2,679.24	-643.20	-2,682.32
N	2,490	2,172	2,490	2,172	2,490	2,172

Notes: Standard errors in parentheses, * statistically significant at 10%; ** at 5%; *** at 1%.

Discrete changes following Probit estimation, factor changes following Truncated Poisson estimation; All models include the set of controls as outlined in the text.

Source: Austrian FFS 1996. Own calculations.

Table 3: Unions' religious composition and birth outcomes; Hurdle model estimates

	(1) Probit	Truncated Poisson	(2) Probit	Truncated Poisson	(3) Probit	Truncated Poisson
Heterogamous union	-0.027*	0.914	–	–	–	–
	(0.015)	(0.055)				
R: Catholic; P: Other religion	–	–	-0.050	0.866	–	–
			(0.039)	(0.100)		
R: Catholic; P: No religion	–	–	-0.049*	0.951	–	–
			(0.030)	(0.092)		
R: Other relig.; P: Other relig.	–	–	-0.055*	1.096	–	–
			(0.039)	(0.107)		
R: Other religion; P: Catholic	–	–	0.008	0.928	–	–
			(0.027)	(0.095)		
R: Other relig.; P: No religion	–	–	0.044	1.159	–	–
			(0.038)	(0.256)		
R: No relig.; P: No religion	–	–	-0.084***	0.871	–	–
			(0.040)	(0.097)		
R: No religion; P: Catholic	–	–	-0.146***	0.689	–	–
			(0.076)	(0.196)		
R: No rel.; P: Other religion	–	–	-0.108	0.670	–	–
			(0.141)	(0.365)		
R: No believer; P: No believer	–	–	–	–	-0.009	0.767***
					(0.024)	(0.051)
R: Believer; P: No believer	–	–	–	–	-0.010	0.853*
					(0.038)	(0.080)
R: No believer; P: Believer	–	–	–	–	-0.003	0.868
					(0.042)	(0.107)
Chi^2	607.90	307.77	624.15	313.48	605.18	321.98
Log likelihood	-647.26	-2,687.42	-639.13	-2,684.56	-648.61	-2680.31
N	2,490	2,172	2,490	2,172	2,490	2,172

Notes: Standard errors in parentheses, * statistically significant at 10%; ** at 5%; *** at 1%.

Discrete changes following Probit estimation, factor changes following Truncated Poisson estimation; all models include the set of controls as outlined in the text.

Source: Austrian FFS 1996.

Table 4: Transitions to first, second and third birth by females' religious affiliation; estimated hazard ratios from Cox proportional hazard regressions

	(1) First	(2) Second	(3) Third	(4) First	(5) Second	(6) Third	(7) First	(8) Second	(9) Third
R: Protestant	0.938	1.130	1.319	–	–	–	–	–	–
	(0.087)	(0.121)	(0.282)						
R: Other religion	1.115	1.187	1.948**	–	–	–	–	–	–
	(0.161)	(0.195)	(0.530)						
R: No religion	1.083	1.088	2.130**	–	–	–	–	–	–
	(0.111)	(0.145)	(0.644)						
R believes: Certainly yes	–	–	–	0.918	1.190**	1.245*	–	–	–
				(0.062)	(0.092)	(0.148)			
R believes: Rather not	–	–	–	1.101*	1.000	1.252*	–	–	–
				(0.062)	(0.070)	(0.168)			
R believes: Certainly not	–	–	–	1.066	1.104	1.254	–	–	–
				(0.094)	(0.133)	(0.335)			
R: Other religion * strong belief	–	–	–	–	–	–	1.094	0.980	2.098**
							(0.181)	(0.180)	(0.611)
R: No religion * strong belief	–	–	–	–	–	–	0.751	0.958	1.877
							(0.218)	(0.353)	(1.158)
R: Catholic * no strong belief	–	–	–	–	–	–	1.115	0.824**	0.906
							(0.082)	(0.070)	(0.114)
R: Other religion * no strong belief	–	–	–	–	–	–	1.075	0.963	1.166
							(0.118)	(0.122)	(0.267)
R: No religion * no strong belief	–	–	–	–	–	–	1.286**	0.906	2.041**
							(0.163)	(0.146)	(0.718)
Controls	+	+	+	+	+	+	+	+	+
Chi^2	317.06	99.81	85.05	320.95	103.17	78.44	321.72	99.83	87.88
Log likelihood	-14,381.6	-9,877.37	-2,655.86	-14,379.6	-9,875.69	-2,659.16	-14,379.2	-9,877.36	-2,654.44

Notes: R – Respondent; P – Partner; standard errors in parentheses. * statistically significant at 10%; ** at 5%; *** at 1%.

Source: Austrian FFS, 1996. Own calculations.

Table 5: Transitions to first, second and third birth by union's religious composition; estimated hazard ratios from Cox proportional hazard regressions

	(1) First	(2) Second	(3) Third	(4) First	(5) Second	(6) Third	(7) First	(8) Second	(9) Third
Heterogamous union	0.903	0.909	0.844	–	–	–	–	–	–
	(0.057)	(0.070)	(0.136)						
R: Catholic; P: Other religion	–	–	–	0.933	0.837	0.590	–	–	–
				(0.113)	(0.120)	(0.198)			
R: Catholic; P: No religion	–	–	–	1.025	0.874	0.999	–	–	–
				(0.105)	(0.113)	(0.231)			
R: Other rel.; P: Other religion	–	–	–	1.206	1.228	1.908***	–	–	–
				(0.143)	(0.169)	(0.425)			
R: Other religion; P: Catholic	–	–	–	0.858	1.043	1.427	–	–	–
				(0.095)	(0.133)	(0.410)			
R: Other rel.; P: No religion	–	–	–	0.843	1.101	0.523	–	–	–
				(0.209)	(0.329)	(0.268)			
R: No religion; P: No religion	–	–	–	1.186	1.113	1.998**	–	–	–
				(0.136)	(0.160)	(0.632)			
R: No religion; P: Catholic	–	–	–	0.792	1.063	3.053	–	–	–
				(0.182)	(0.364)	(3.124)			
R: No rel.; P: Other religion	–	–	–	1.049	0.626	–	–	–	–
				(0.474)	(0.382)				
R: No strong belief; P: No strong belief	–	–	–	–	–	–	1.067	0.744***	0.743**
							(0.094)	(0.073)	(0.107)
R: Strong belief; P: No strong belief	–	–	–	–	–	–	0.912	0.798	0.735
							(0.111)	(0.110)	(0.151)
R: No strong belief; P: Strong belief	–	–	–	–	–	–	1.145	1.134	0.694
							(0.176)	(0.199)	(0.199)
Controls	+	+	+	+	+	+	+	+	+
Chi^2	317.40	99.58	76.70	325.27	104.25	83.68	322.27	105.74	93.44
Log likelihood	-14,381.4	-9,877.49	-2,660.03	-14,377.4	-9,875.15	-2,656.54	-14,378.9	-9,874.41	-2,651.66

Notes: R – Respondent; P – Partner; standard errors in parentheses. * statistically significant at 10%; ** at 5%; *** at 1%.

Source: Austrian FFS, 1996. Own calculations.

Figure 1: Number of children, by homogamous and heterogamous unions

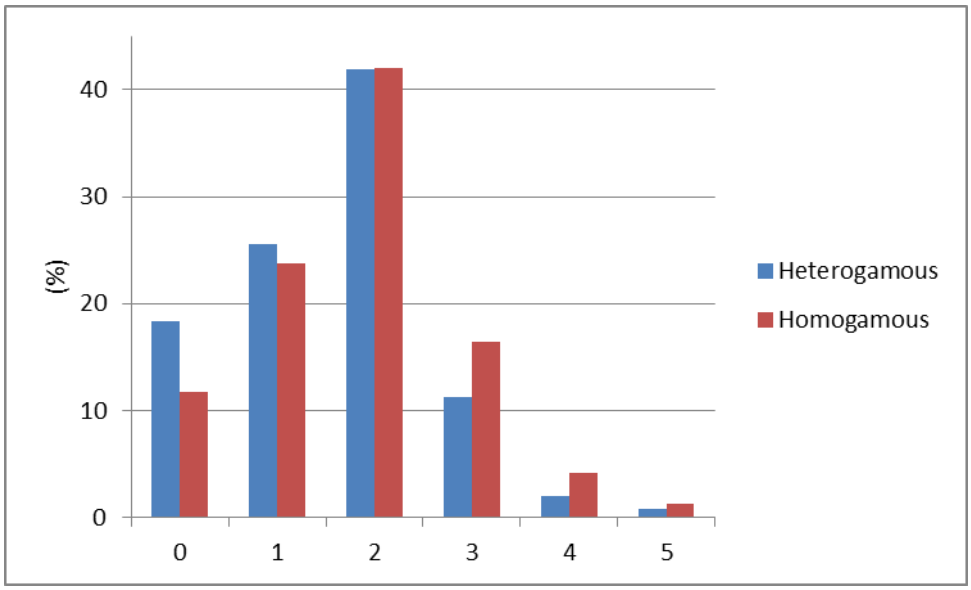

Figure 2: Months to first, second and third birth by unions' religious composition