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Evidence for Austria

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Abstract

Data from the Austrian Family and Fertility Survey are used to examine for the first time the contemporary relationship between religion and fertility in first unions in Austria. Although Austria is a Catholic country, results from a Poisson hurdle model show that both women's denominational affiliation and religiosity affect the number of children born. Unions' religious composition does not result in clear evidence. There furthermore is mainly no effect of religion on the timing of births. There however is a puzzle: Females and unions of other than Catholic or no religious affiliation have a higher transition rate to third birth.

Keywords: Religion, fertility, count data, Poisson hurdle model, Austria
JEL Classification: J13, Z12

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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 religion. 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). The findings provided in this literature 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, e.g., 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 have there been extensions to this branch of research in as individuals' religious affiliation and the effects of the religious composition of unions are analyzed from an economic point of view (Lehrer, 1996; Adsera, 2004). As partners may differ both in religious affiliation and religious belief, conflicts may arise over the religious education of the couple's children and even before that over the desired number of children and the timing of births.

This paper adds threefold to the literature. First, it examines contemporary data from Austria for the first time, allowing for further transcontinental 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 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.

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

Second, the religious composition of unions plays a role in itself in as inner-partnership processes may also affect individual demographic behavior.

With regard to the first strand, 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 then 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 the use of contraception and the attitude 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 particularly be relevant for shaping demographic patterns of religious minority groups. 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] As another example, Mormon and Catholic faith embodies (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 c.p. 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

[2] McQuillan (2004) nicely summarizes Goldscheider's work and discusses the sources of religious influence in more detail for Christianity and to some lesser extent also for Islam and Asian religions.

[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).

fertility should c.p. be lower compared to another union where one partner belongs to this religious group and another is affiliated to a pronatalist group.

There is a second 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 conflicts over - relevant here - fertility decisions. Insofar as the partners and particularly women recognize the instability of such a union, they have an incentive to maker fewer investments in spouse-specific human capital, i.e. children. Women furthermore have an incentive to rather invest in labor market related human capital that becomes valuable in the case of divorce. The “marital stability effect” consequently implies that inter-faith couples will have a low fertility. This may be expected because of the relatively short duration of such a union and may also occur as the partners restrict their fertility behavior while their unions are still intact.

As mentioned, there is a large body of relevant demographic literature. McQuillan (2004) provides a range of relevant references and findings that are not summarized in this paper to economize upon space. Apart from that there are to the best knowledge only two studies that examine both the fertility effects of individuals’ religious affiliation and also the impact of unions’ religious composition. 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. Furthermore, her findings suggest for substantial fertility differentials for inter-faith unions in which the woman is either Catholic or Mormon. While for example a homogamous Catholic union has a predicted family size of almost 2.5 children, unions where the husband has a different religious affiliation have predicted 2.2 children. Unions where the husband has no religion are predicted to have 2.0 children. Similarly, the predicted family size for Mormons decreases from about 3.3 in homogamous unions to about 2.5 children when 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 in 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. As a result, the spacing of the second birth is not differentiated across homogamous and heterogamous groups. Yet, the findings 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. First, a higher predicted family size may be expected for Catholic females compared to women with other religion and in particular compared to those with no religion. Furthermore, compared to homogamous Catholic unions, inter-faith couples are expected to have lower fertility. As for the impact of religious belief, similar effects might be expected, depending on whether the female or the male is the religious partner. In addition, broadly the same picture should display regarding the effects of religion on the timing of births: Individuals with pronatalist religious ideology should have higher progression rates, mainly for the transitions to first and third child.

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 indicators of 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

[4] There however is a statistically significant difference between non-practicing Catholics and females with no religion. The predicted family sizes are 3.9 and 3.7 respectively.
[5] For more information, see http://www.unece.org/ead/pau/ffs/Welcome.html.

survey would be most interesting, the harmonized data do only partially provide information on individuals' religious affiliation. Therefore, this analysis explores the Austrian national sample only. This sample was surveyed between December 1995 and May 1996, covering about 6.000 individuals, aged 20 to 54 years old. The sample, which also includes non-Austrian citizens, is representative both on a national level and a federal level.

Restricting the sample to females in first unions, allowing for comparisons to prior analyses (Lehrer 1996; Adsera 2004), and excluding observations with missing values in relevant variables, there are 2,490 observations used for the analyses on the number of children born. To analyze 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 indicating the duration either between the first and the second or between the second and the third birth.

The central variables of interest are indicators on individuals' religious involvement. In the Austrian FFS, information on religion is given by respondents' current religious affiliation and belief.[7] Furthermore, there are also indicators on the partner's religion which allows for analyzing fertility behavior of both intra-faith and inter-faith couples. 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, a dummy for whether the woman is 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.

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

[7] There are some differences in the FFS national surveys regarding the information on religion. The most extensive questionnaire has been issued in Germany 1992. This questionnaire covers religious affiliation, religiousness and church attendance rates both of the respondent and his or her partner as well as the respondent's attitude towards the role of religion and the importance of God. Future research may and should explore this valuable dataset. Furthermore, while it would be interesting to analyze the effects of religious involvement in the respondent's childhood or youth to replicate the analysis of Lehrer (1996) or Sander (1992), no such information is given in the FFS.

In the analyses of the timing of births, all mentioned covariates except of the duration of the union are included. Additional regressors in the regressions of the timing of the second birth are the 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.[8]

The following methods are used in the analyses. First, in contrast to Lehrer (1996) and Adsera (2004) who employ OLS, a Poisson hurdle model is applied to examine the effects of religion on the number of marital or non-marital births.[9] The Poisson hurdle model is more appropriate than OLS as it takes into account the discrete nature of the dependent variable as well as that there may be two underlying processes that lead to either zeros or positive outcomes.[10] 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

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[8] Note that the regression results of the controls are not discussed to economize upon space.

[9] There is no specific differentiation between children born within marriage and out-of-wedlock children as cohabitation is no rare phenomenon in Austria: In 1996, about 9.6% of all unions of females of age 15 or older are non-marital unions (Österreichisches Statistisches Zentralamt, 1996). In 2001, this share increased to 11.3%. (Schipfer, 2003).

[10] 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 applied 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

$$\begin{aligned}\ln L &= \ln\left\{\prod_{i\in\Omega_0}\left(e^{-e^{x_i\beta_1}}\right)\prod_{i\in\Omega_1}\left(1-e^{-e^{x_i\beta_1}}\right)\prod_{i\in\Omega_1}\frac{e^{y_i x_i\beta_2}}{\left(e^{e^{x_i\beta_2}}-1\right)y_i!}\right\}\\ &= \ln\left\{\sum_{i\in\Omega_0}-e^{x_i\beta_1}+\sum_{i\in\Omega_1}\ln\left(1-e^{-e^{x_i\beta_1}}\right)\right\}+\left\{\sum_{i\in\Omega_1}y_i x_i\beta_2-\sum_{i\in\Omega_1}\ln\left(e^{e^{x_i\beta_2}}-1\right)-\sum_{i\in\Omega_1}\ln\left(y_i!\right)\right\}\\ &= \ln\left\{L_1\left(\beta_1\right)\right\}+\ln\left\{L_2\left(\beta_2\right)\right\}\end{aligned} \tag{3.5}$$

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

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, $\ln L_2\left(\beta_2\right)$.

Therefore, without losing information, the hurdle model can 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.

Thereafter, the timing of births is analyzed applying Cox proportional hazard models. The model is as follows (Greene, 2003):

$$\lambda(t_i)=\lambda_o(t_i)\exp(x_i'\beta) \tag{3.6}$$

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 includes the respective set of indicators on individuals' religious affiliation, their belief and the union's religious composition.

4. Results

Before discussing the results from the regressions, some descriptive findings for the religion variables are presented.[11]

Figure 1 shows the (censored) distribution of the number of children by intra- and inter-faith partnerships.[12] 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 both individuals' denominational affiliation and their 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 about 1.2 children. Furthermore, the distribution of the differences between observed and expected frequencies shows no clear pattern for Protestants and females with other religion. However, contrasting Catholic women and women without denominational affiliation, there is a negative difference between observed and expected frequencies for the zero-birth outcomes and positive differences for the non-negative birth outcomes. This indicates that Catholic women are less likely than expected to have zero births and more likely than expected to have positive and particularly higher order birth outcomes. A reversed picture shows for women without denominational affiliation: There are large positive differences between observed and expected frequencies for both the zero-births and the one-child outcomes and large negative differences for the two and more children outcomes. This therefore indicates that women with no religion are more likely than expected to either have zero births or one child only and that they are less likely than expected to have positive and higher order

[11] Descriptive statistics of the whole sample including the controls are provided in the Appendix.
[12] The distributions shown are limited to a maximum number of five children as there are no inter-faith partnerships that have more than 5 children and only a few homogamous unions that have up to 8 children.

birth outcomes. The Chi^2-test statistic of 134.48 suggests rejecting the assumption of independence of religious affiliation and the number of births.

(Table 1 about here)

Differentiating for individuals' religious belief, the findings presented in the lower part of Table 1 also suggest for a relationship between religiosity and birth outcomes. On average, there is 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 on the other side of the spectrum, the average number children decreases to some 1.2 children for women who do not have a religious belief. As for the differences between observed and expected number of frequencies of births, Table 1 furthermore indicates that strong religious believers are less likely than expected to have zero births or one child only, while they are more likely than expected to particularly have higher order birth outcomes, i.e. 3 and more children. While the findings is not clear cut for individuals with some religious belief, non-believers and strong non-believers are more likely than expected to either have zero births or one child only and that they are less likely than expected to have two or more children. Complementary to the finding for religious affiliation, the Chi^2-test statistic of 43.51 also suggests rejecting the assumption of independence of religious belief and the number of births

4.1 Family size by religion

The results from the hurdle models are provided in Table 2 and Table 3: First, Table 2 presents the findings for the relationship between women's religious involvement and birth outcomes; Table 3 provides the results for the specifications on the unions' religious composition. Thereafter, predicted family size by religion is given in Table 4. In addition to the predictions from the hurdle models, results from (rather biased) OLS regressions are presented to allow for comparison to the findings of Lehrer (1996) and Adsera (2004).

With regard to women's religious affiliation, the regressions suggest that in contrast to prior expectations, both Protestant females and women with other religious affiliation do not differ statistically both in the likelihood of giving birth at all and in the number of children born compared to Catholics (Table 2, specification 1). However, in line with theoretical reasoning, women without religion both are less likely to have children at all and, giving 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. However, Compared to women who have a less distinct religious belief, a strong religious belief affects the number of children positively, while having no belief at all is negatively associated with family size, the expected number of children increase and decrease by about 20 per cent respectively.

(Table 2 about here)

Interacting females' religious affiliation and belief, the Probit model reinforces that, irrespective of the women's religious belief, women without religious affiliation are less likely to give birth. Furthermore, on a 10 per cent significance level, both Catholic women and females of any other religious affiliation who have no religious belief, have fewer expected children compared to Catholic believers, the factor changes are 0.9 and 0.7 respectively.

As for the unions' religious composition, Table 3 shows that, compared to their homogamous counterparts, the predicted probability of having children decreases by 0.3 for heterogamous unions. Given that the coefficient is statistically significant on the 10 per cent level only and that the predicted number of births of heterogamous unions is not statistically different from that of intra-faith unions, one might conclude that the religious composition of unions may not make a difference. However, further specifying individuals' religious affiliation there is support of both the 'marital stability effect' and the 'bargaining effect' inasmuch there is evidence of a decreased likelihood of having children for unions in which one of the partners has no religion. In particular, the predicted probability of having children decreases by about 0.5 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. Furthermore, it decreases by 0.8 for unions in which both partners have no religious affiliation. While these findings are also accompanied by factor changes that point to a lower number of children born to such couples, the estimates of the truncated Poisson model are not statistically significant.

(Table 3 about here)

With regard to the religious belief composition of the union, there is only weak 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 religious believers.

While all indicators point to a negative relationship, the coefficient for inter-faith couples, in which only the woman is a believer is statistically significant at the 10 per cent level. The coefficient on unions in which the partner has a stronger religious belief is also statistically insignificant. However, it should be noted that there are only a few observations for this category so that this finding rather may be a question of sample size limitation.[13] Furthermore, while the first step in the hurdle model only weakly supports *a priori* reasoning, the results from the count data model reinforce expectations inasmuch as unions in which both partners are non-believers and unions in which the partner has no religious belief have fewer children. Compared to the reference category of a homogamous believer union, the expected numbers of births decrease by a factor of 0.8 and 0.9 respectively.

Calculating predicted family size from the Poisson regressions results and contrasting these with predictions from OLS regressions for comparison with prior research, there are several points to be mentioned. First, the predictions resulting from the Hurdle model fit the descriptive findings for respondents' religious affiliation and belief, as shown in Table 1, better than the predictions from OLS: While the Poisson regressions only slightly underestimate the number of children born, the OLS predictions largely overestimate them (Table 4, columns 1 to 4). Furthermore, while the OLS estimation suggests for more statistical effects of religion on fertility, one should remember that it yields possibly biased results.

As for the predicted family size based on the Hurdle models, Table 4 further indicates that there are only small differences in family size for the reference categories, ranging from 1.56 for Catholic women (Table 4, column 1) to 1.74 for unions in which both partners are religious believers (Table 4, column 12).

(Table 4 about here)

However, there are larger differences within the model specifications accounting for the respective religion regressors. As for females' religious affiliation, there are statistically significant differences in predicted family size in a range of 0.4 to 0.6. In particular, compared to Catholic females, who have 1.6 children, women with no religion have only 1.2 children. Furthermore, strong religious believers have a predicted family size of almost 2 which is one point larger than the family size of women who have no religious belief. A similar, though weaker findings show for the interaction variables:

[13] Only 2.9%, i.e. 72 out of 2,490 observations used for the regressions are in this category.

The results suggest that fertility differences exist between, on the one hand, Catholic believers and, on the other hand, Catholic women and females of no religion who are non-believers. The differences are 0.4 and 0.5 respectively.
The fertility differences between homogamous and heterogamous unions are less distinct. While there is no evidence for differences in family size with regard to unions' affiliation composition, religious non-believers again have fewer children: Compared to unions in which both partners are believers, unions in which the partner is a non-believer have about 0.3 fewer children, and homogamous non-believer unions even have 0.5 fewer children.

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 latter, the 95 per cent confidence interval band of the survival function of heterogamous unions completely overlays the survival function of homogamous couples, so that there is no statistical significance 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 heterogamous unions is tangent to most of the survival function of homogamous couples so that there too is no statistical significance between the two groups.

(Figure 2 about here)

Furthermore, these findings are based on nonparametric estimates so that other possible variables are not controlled for. Therefore, Cox proportional hazard models are conducted that include the whole range of controls as outlined above. Table 5 provides the regression results for the transitions to first, second and third birth for females' religious involvement, Table 6 analogously presents the results for unions' religious composition.[14]
The results from these regressions suggest for mainly no effects of females' religious affiliation and belief on the transition to first birth (Table 5). Even more so, there are only two statistically significant results in contrast to prior expectations. In particular, there is evidence that women with rather no religious belief and the responding

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

interaction with Catholic affiliation yields a slightly faster transition to first birth compared to believers or Catholic believers respectively. However, the change in the estimated hazard ratio of about 1.1 may substantially be considered small. The transition to the second birth is even less affected by females' religion than the transition to first birth. There is only one statistically significant result for women with strong religious belief. The hazard ratio, however, changes by about 1.2, which again suggests for a small effect.

(Table 5 about here)

Surprisingly, the largest effects show for the transition to third births. However, while a priori expectations 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 change by 1.6 and by almost 2.2 (Table 5, column 3). While religious belief itself is not associated with the transition to third birth, the model specification including the interaction variables yields changes in hazard ratios of 1.5 for believers of other than Catholic affiliation and of almost 3.3 for believers with no religion (Table 5, column 9). It cannot easily be answered what causes exist for these results that are contrary to theoretical reasoning. On the one hand, it may well be, that there are a variety of rather heterogeneous religious groups included in the 'other religious affiliation' category that are 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 ones. 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 the transition to births and unions' religious composition, the results from the Cox proportional hazard models indicate that heterogamity in the broadest sense does neither fasten nor slow down the transition rates (Table 6, columns 1 to 3). Further differentiating partners' religious affiliation, the regression results suggest for no effects of the religious composition of the partners on the transition to second birth and there is only a weak effect on the transition on first birth for homogamous unions of other than Catholic affiliation. 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.[15] The transition rates change by about 1.6 and 2.1. While these findings are related to the above mentioned puzzle, there is further evidence that Catholic women with partners who have any other religious affiliation postpone third births by a factor change of 0.6 (Table 6, column 6). This result may be interpreted in line with prior reasoning insofar that religious heterogamity may induce potential conflicts between partners over fertility behavior.

(Table 6 about here)

Compared to unions in which both partners have a religious belief, 'non-believer' unions have a slightly higher transition to first birth, which also is in contrast to prior expectation. However, in line with theoretical reasoning are the results couples in which the woman is a religious believer, while the partner is not. For this combination, the estimated hazard ratios of 0.8 and 0.7 suggest for a slower transition both between first and second birth and between second and third birth.

5. Concluding remarks

This paper studies the relationship between individuals' religious involvement, unions' religious composition and first unions' fertility 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 individuals' use of contraception or abortion. Furthermore, indirect effects on fertility behavior may arise because of the religions' ideology with regard to for instance gender role attitudes.

While females' religion may influence fertility behavior by itself, unions' religious composition 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 model regressions suggest that there are differences in predicted

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

family size between Catholic women on the one hand and women with no religion on the other hand. Even larger differences in predicted family size 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 mainly no evidence for a relationship between religion and the transitions to births. There furthermore are results that are in contrast to theoretical reasoning. 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, the German part of the FFS should be explored because of its richness in indicators on individuals' religion. As Germany is not a 'pure' Catholic country as Austria, this would for instance allow examining whether there are contemporary fertility differences between Catholics and Protestants.

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 believer	0.608	(0.488)	0	1
R: Other religious affiliation and believer	0.068	(0.252)	0	1
R: No religious affiliation and believer	0.027	(0.164)	0	1
R: Catholic and no believer	0.232	(0.422)	0	1
R: Other religious affiliation and no believer	0.029	(0.169)	0	1
R: No religious affiliation and no believer	0.032	(0.177)	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 religious affiliation; P: Other religious affiliation	0.046	(0.211)	0	1
R: Other religious affiliation; P: Catholic	0.043	(0.204)	0	1
R: Other religious affiliation; P: No religious affiliation	0.007	(0.087)	0	1
R: No religious affiliation; P: No religious affiliation	0.043	(0.204)	0	1
R: No religious affiliation; P: Catholic	0.013	(0.116)	0	1
R: No religious affiliation; P: Other religious affiliation	0.002	(0.052)	0	1
R: Believer; P: Believer	0.519	(0.499)	0	1
R: No believer; P: No believer	0.265	(0.441)	0	1
R: Believer; P: No believer	0.185	(0.389)	0	1
R: No believer; P: Believer	0.028	(0.167)	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, 1995-96.

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Table 1: Differences between observed and expected number of children by religious affiliation

No. of children	Catholic	Protestant	Other religion	No religion
0	-28.8	6.0	-0.5	23.3
1	0.8	-8.0	-2.0	9.2
2	9.6	0.4	2.9	-12.8
3	14.8	1.6	-2.2	-14.2
4 and more	3.5	0.0	1.8	-5.4
Average no. of children	1.68	1.64	1.68	1.18
No. of children	R believes: Certainly yes	R believes: Rather yes	R believes: Rather not	R believes: Certainly not
0	-16.5	-43.6	45.0	15.1
1	-22.5	-14.0	16.7	19.9
2	-5.5	51.5	-30.0	-16.0
3	22.2	8.2	-18.7	-11.8
4 and more	22.3	-2.0	-13.1	-7.2
Average no. of children	2.07	1.72	1.36	1.24

Notes: LR-Test: Chi^2 values of 134.48 and 43.51 with df=12 and Prob > 0.000 for religious affiliation and religios belief, respectively.
Source: Austrian FFS 1996-96. Own calculations, weighted.

Table 2: Respondent's religious involvement and birth outcomes; Hurdle model estimates including further control variables

	Model specification 1		Model specification 2		Model specification 3	
	Probit	Truncated Poisson	Probit	Truncated Poisson	Probit	Truncated Poisson
R: Catholic	(Reference category)					
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 yes			(Reference category)			
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 Catholic * believer					(Reference category)	
R: Other religion * believer	–	–	–	–	-0.005	1.088
					(0.025)	(0.083)
R: No religion * believer	–	–	–	–	-0.102**	0.816
					(0.052)	(0.112)
R: Catholic * No believer	—	—	—	—	0.007	0.906*
					(0.013)	(0.047)
R: Other religion * No believer	—	—	—	—	-0.007	0.774*
					(0.033)	(0.111)
R: No religion * No believer	—	—	—	—	-0.072**	0.823
					(0.042)	(0.122)
Chi^2	616.48	309.00	605.32	324.12	616.01	317.95
Log likelihood	-642.97	-2686.80	-648.54	-2679.24	-643.20	-2682.32
Observations	2490	2172	2490	2172	2490	2172

Notes: Standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%
Discrete changes following Probit estimation, factor changes following Truncated Poisson estimation

Source: Austrian Family and Fertility Survey 1996. Own calculations.

Table 3: Unions' religious composition and birth outcomes; Hurdle model estimates including further control variables

	Model specification 1		Model specification 2		Model specification 3	
	Probit	Truncated Poisson	Probit	Truncated Poisson	Probit	Truncated Poisson
Homogamous union	(Reference category)					
Heterogamous union	-0.027*	0.914	—	—	—	—
	(0.017)	(0.055)				
R: Catholic; P: Catholic			(Reference category)			
R: Catholic; P: Other religion	—	—	-0.050	0.866	—	—
			(0.039)	(0.100)		
R: Catholic; P: No religion	–	–	-0.049*	0.951	–	–
			(0.032)	(0.092)		
R: Other rel.; P: Other religion	–	–	-0.055*	1.096	–	–
			(0.039)	(0.107)		
R: Other religion; P: Catholic	—	—	0.008	0.928	—	—
			(0.027)	(0.095)		
R: Other rel.; P: No religion	—	—	0.044	1.159	—	—
			(0.038)	(0.256)		
R: No religion; 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: Believer; P: Believer					(Reference category)	
R: No believer; P: No believer	–	–			-0.003	0.841***
					(0.014)	(0.043)
R: Believer; P: No believer	—	—			-0.030*	0.903*
					(0.018)	(0.048)
R: No believer; P: Believer	—	—			-0.052	1.035
					(0.043)	(0.121)
Chi^2	607.90	307.77	624.15	313.48	610.17	318.89
Log likelihood	-647.26	-2687.42	-639.13	-2684.56	-646.12	-2681.86
Observations	2490	2172	2490	2172	2490	2172

Notes: Standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%
Discrete changes following Probit estimation, factor changes following Truncated Poisson estimation

Source: Austrian Family and Fertility Survey 1996. Own calculations.

Table 4: Religion and predicted number of children

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	OLS	Hurdle	OLS	Hurdle	OLS	Hurdle	OLS	Hurdle	OLS	Hurdle	OLS	Hurdle
R: Catholic	1.81	1.56	—	—	—	—	—	—	—	—	—	—
R: Protestant	1.87	1.57	—	—	—	—	—	—	—	—	—	—
R: Other religion	1.79	1.61	—	—	—	—	—	—	—	—	—	—
R: No religion	1.51***	1.18*	—	—	—	—	—	—	—	—	—	—
R believes: Certainly yes	—	—	1.99***	2.04***	—	—	—	—	—	—	—	—
R believes: Rather yes	—	—	1.75	1.59	—	—	—	—	—	—	—	—
R believes: Rather not	—	—	1.70	1.29	—	—	—	—	—	—	—	—
R believes: Certainly not	—	—	1.56**	1.04**	—	—	—	—	—	—	—	—
R Catholic * believer	—	—	—	—	1.84	1.67	—	—	—	—	—	—
R: Other religion * believer	—	—	—	—	1.96	1.76	—	—	—	—	—	—
R: No religion * believer	—	—	—	—	1.47***	1.32	—	—	—	—	—	—
R: Catholic * No believer	—	—	—	—	1.75**	1.26*	—	—	—	—	—	—
R: Other religion * No believer	—	—	—	—	1.58**	1.14*	—	—	—	—	—	—
R: No religion * No believer	—	—	—	—	1.55***	1.06		—	—	—	—	—
Homogamous union	—	—	—	—	—	—	1.78	1.58	—	—	—	—
Heterogamous union	—	—	—	—	—	—	1.65**	1.30	—	—	—	—
R: Catholic; P: Catholic	—	—	—	—	—	—	—	—	1.84	1.59	—	—
R: Catholic; P: Other religion	—	—	—	—	—	—	—	—	1.61**	1.31	—	—
R: Catholic; P: No religion	—	—	—	—	—	—	—	—	1,70	1.35	—	—
R: Other rel.; P: Other religion	—	—	—	—	—	—	—	—	1.86	1.79	—	—
R: Other religion; P: Catholic	—	—	—	—	—	—	—	—	1.79	1.55	—	—
R: Other rel.; P: No religion	—	—	—	—	—	—	—	—	2.06	1.53	—	—
R: No religion; P: No religion	—	—	—	—	—	—	—	—	1.56***	1.32	—	—
R: No religion; P: Catholic	—	—	—	—	—	—	—	—	1.44 **	0.74	—	—
R: No rel.; P: Other religion	—	—	—	—	—	—	—	—	1.28	0.93	—	—
R: Believer; P: Believer	—	—	—	—	—	—	—	—	—	—	1.80	1.74
R: No believer; P: No believer	—	—	—	—	—	—	—	—	—	—	1.66***	1.19***
R: Believer; P: No believer	—	—	—	—	—	—	—	—	—	—	1.67***	1.48*
R: No believer; P: Believer	—	—	—	—	—	—	—	—	—	—	1.76	1.59

Notes: Reference categories in italics; * significant at 10%, ** significant at 5%, *** significant at 1%

Source: Austrian FFS, 1995-96. Own calculations.

Table 5: Transitions to first, second and third birth by females' religious affiliation; estimated hazard ratios from Cox proportional hazard regressions including further control variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	First	Second	Third	First	Second	Third	First	Second	Third
R: Catholic		(Reference category)		—	—	—	—	—	—
R: Protestant	0.929	1.129	1.317	—	—	—	—	—	—
	(0.085)	(0.120)	(0.277)						
R: Other religion	1.137	1.108	1.589*	—	—	—	—	—	—
	(0.140)	(0.161)	(0.409)						
R: No religion	1.077	1.081	2.187***	–	–	–	—	—	—
	(0.110)	(0.144)	(0.619)						
R believes: Certainly yes	—	—	—	0.917	1.184**	1.206	—	—	—
				(0.062)	(0.091)	(0.142)			
R believes: Rather yes	—	—	—		(Reference category)		—	—	—
R believes: Rather not	—	—	—	1.100*	1.001	1.193	—	—	—
				(0.062)	(0.069)	(0.160)			
R believes: Certainly not	–	–	–	1.074	1.104	1.081	—	—	—
				(0.095)	(0.133)	(0.286)			
R Catholic * believer	—	—	—	—	—	—		(Reference category)	
R: Other religion * believer	—	—	—	—	—	—	1.059	1.113	1.478**
							(0.094)	(0.111)	(0.277)
R: No religion * believer	—	—	—	—	—	—	1.062	1.082	3.255***
							(0.149)	(0.186)	(1.168)
R: Catholic * No believer	—	—	—	—	—	—	1.142**	0.991	1.147
							(0.063)	(0.067)	(0.149)
R: Other religion * No believer	—	—	—	—	—	—	0.951	1.142	1.457
							(0.127)	(0.205)	(0.492)
R: No religion * No believer	—	—	—	—	—	—	1.171	1.076	1.517
							(0.165)	(0.213)	(0.634)
Chi^2	317.06	99.81	85.05	320.95	103.17	78.44	321.72	99.83	87.88
Log likelihood	-14,381.60	-9,877.37	-2,655.86	-14,379.65	-9,875.69	-2,659.16	-14,379.27	-9,877.36	-2,654.44

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

Source: Austrian FFS, 1995-96. Own calculations.

Table 6: Transitions to first, second and third birth by union's religious composition; estimated hazard ratios from Cox proportional hazard regressions including further control variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	First	Second	Third	First	Second	Third	First	Second	Third
Homogamous union	(Reference category)			—	—	—	—	—	—
Heterogamous union	0.904	0.907	0.817	—	—	—	—	—	—
	(0.057)	(0.069)	(0.131)						
R: Catholic; P: Catholic	—	—	—	(Reference category)			—	—	—
R: Catholic; P: Other religion	—	—	—	0.946	0.834	0.560*	—	—	—
				(0.114)	(0.119)	(0.189)			
R: Catholic; P: No religion	—	—	—	1.031	0.872	0.911	—	—	—
				(0.105)	(0.113)	(0.210)			
R: Other rel.; P: Other religion	—	—	—	1.221*	1.168	1.656**	—	—	—
				(0.131)	(0.146)	(0.349)			
R: Other religion; P: Catholic	—	—	—	0.849	1.037	1.438	—	—	—
				(0.093)	(0.132)	(0.413)			
R: Other rel.; P: No religion	—	—	—	0.831	1.084	0.547	—	—	—
				(0.206)	(0.323)	(0.272)			
R: No religion; P: No religion	—	—	—	1.183	1.108	2.116**	—	—	—
				(0.136)	(0.159)	(0.623)			
R: No religion; P: Catholic	—	—	—	0.779	1.071	2.788	—	—	—
				(0.179)	(0.367)	(2.851)			
R: No rel.; P: Other religion	—	—	—	1.080	0.599	—	—	—	—
				(0.487)	(0.355)				
R: Believer; P: Believer	—	—	—	—	—	—	(Reference category)		
R: No believer; P: No believer	—	—	—	—	—	—	1.122**	0.937	1.029
							(0.061)	(0.063)	(0.138)
R: Believer; P: No believer	—	—	—	—	—	—	0.953	0.828***	0.692***
							(0.056)	(0.058)	(0.095)
R: No believer; P: Believer	—	—	—	—	—	—	0.907	1.019	0.981
							(0.125)	(0.165)	(0.271)
Chi^2	317.40	99.58	76.70	325.27	104.25	83.68	322.27	105.74	93.44
Log likelihood	-14,381.43	-9,877.49	-2,660.03	-14,377.49	-9,875.15	-2,656.54	-14,378.99	-9,874.41	-2,651.66

Notes: R – Respondent; P – Partner; standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Source: Austrian FFS, 1995-96. Own calculations.

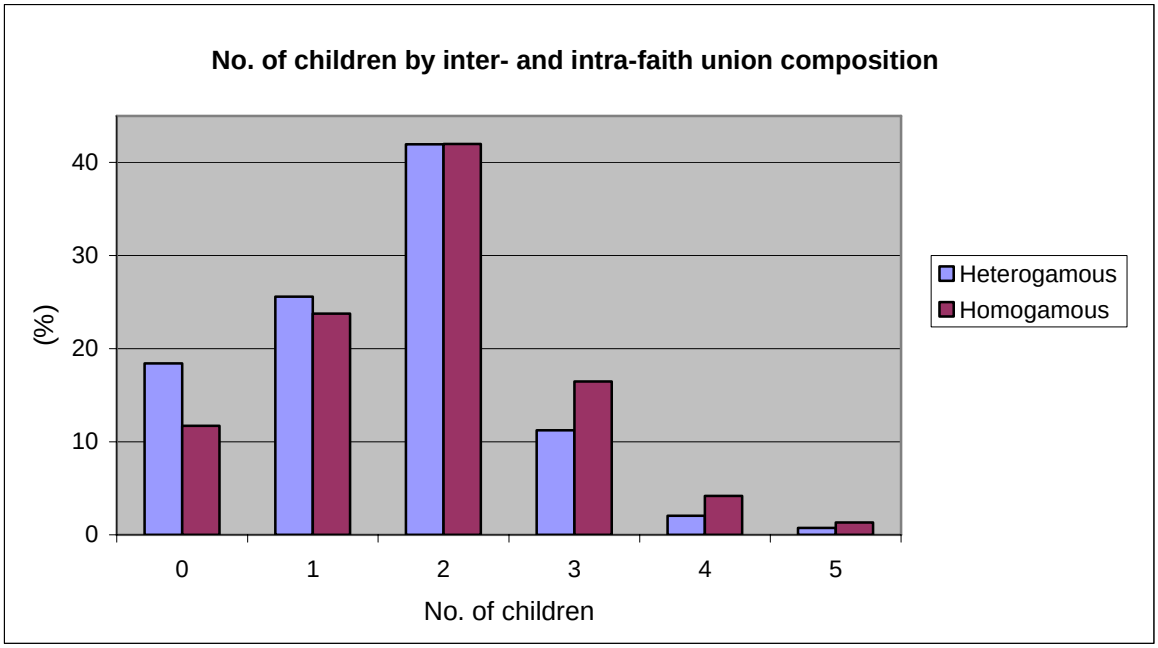

Figure 1: Number of children by intra- and inter-faith unions

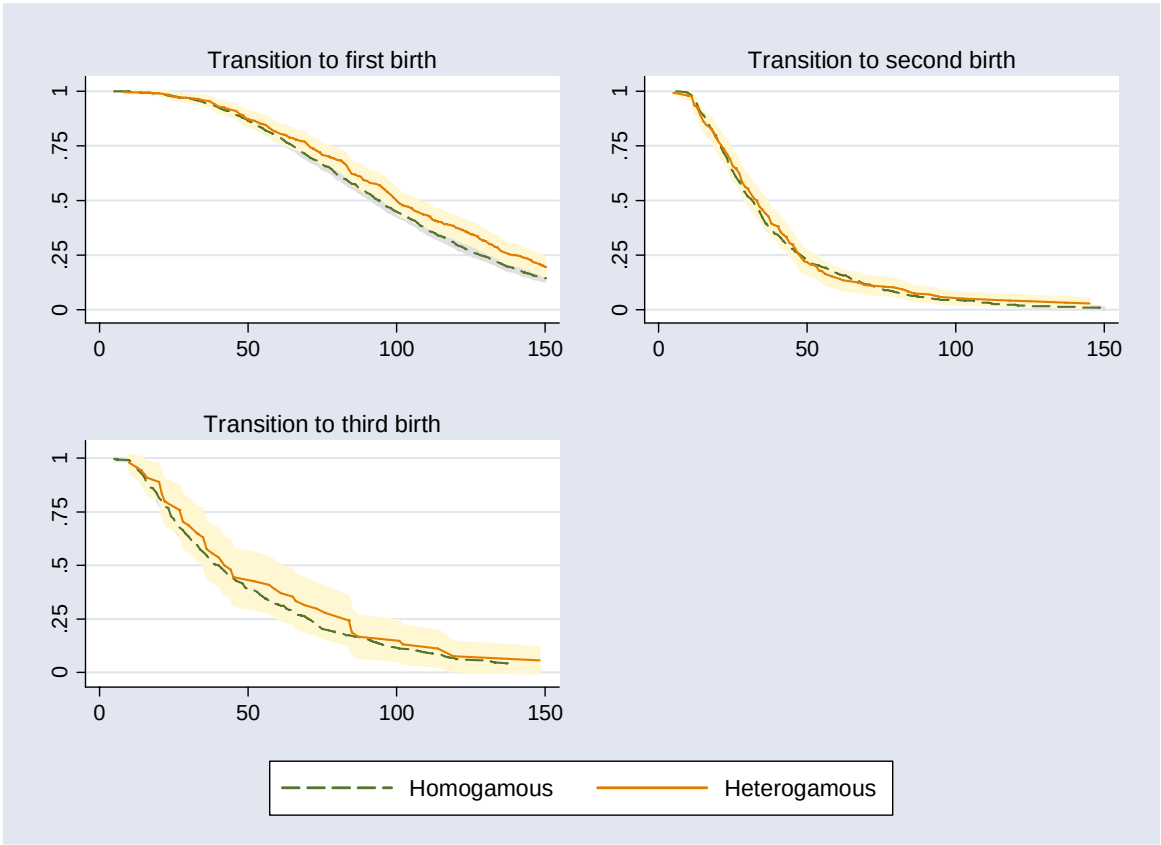

Figure 2: Months to first, second and third birth by unions' religious composition