The changing landscape of religious affiliation in Brazil 1970-2010: age, period and cohort perspectives

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Key words: Religious affiliation, Age-period-cohort analysis, Cross-Classified Random Effects models, Brazil

This is a proposed paper in which we will examine religious affiliation in Brazil in the last 40 years using synthetic cohorts and Censuses data.

ABSTRACT

Brazil has experienced enormous religious changes in the past half century, primarily characterized by a sudden drop in the number of Catholics along with a major increase in the proportion of Protestants and people without any religious affiliation. The exact nature of these changes, however, is poorly understood from a demographic and sociological perspective. This paper examines changes in the proportion of religious affiliation (Mainline Protestants, Pentecostals, Neo-pentecostals, Catholics, and those without religion) across different birth cohorts that we built using individual-level data from several decennial Censuses of Brazil

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(1970-2010). Drawing on Hierarchical Age-Period-Cohort (HAPC) and Cross-Classified Random Effects models (CCREM), we examine the extent to which age, period, and cohort processes characterize religious changes in Brazilian society controlling for sex, education, level of urbanity, and geographic area.

1 - INTRODUCTION

The number of self-declared Catholics in Brazil has declined precipitously in the past half-century. According to the Census, the percentage dropped from 95% in 1940 to 65% in 2000. The reduction in Catholics is attributed to an increase in the growth of Pentecostal churches, as well as an increase in the number of people without religious affiliation (Decol, 1999; Costa et al, 2005; Alves & Novellino, 2003; McKinnon et al, 2008). In the same 60 year period, the proportion of Protestants increased from 3% to 22%, while those who self-reported themselves as without religious affiliation increased from 1% to 8% of the total (Mariano, 2004; Costa et al, 2005; McKinnon et al, 2008; Alves & Novellino, 2006). People who declared themselves as "other religions" increased from 2% to 5% during 70 years.

Is this continuous phenomenon equally spread throughout all age groups and across all birth cohorts, or have the changes been led by subgroups, such as the younger generation or the ones with specific characteristics, such as inhabitants of urban areas and highly educated? While much is being done revealing the substantive differences regarding cults and church participation in Brazil (Verona, 2010), little is known about how these compositional changes transformed the religious landscape leading to a massive shift towards more conservative groups (going from being Catholic to being Pentecostals or neo-Pentecostals) in the same decades that we started to observe an increase of no affiliations.

Understanding the patterns of change and growth is an important step in discovering what Brazilians are pursuing when they switch affiliations or decide to abandon religious life. For example, religion conversion might be the expression of different necessities at the societal and individual levels, such as the search for spiritual comfort and/or the search for financial assistance and social capital that often is provided in the church realm. In that sense, the expansion of the Neo-pentecostals, a major religious group that has attracted millions of

members in just a few years of establishment, could have been fostered by the lower educated, lower SES inhabitants.

On the other hand, the shift toward no-affiliation might be an indication of secular changes and an indication that religion might no longer dictate the norms and influence values, whether they are individual or shared in a societal level. It is possible, for example that the detachment between church and state promoted secular changes in institutions that ultimately caused people to not have the church as part of their rites of passage and governing institutions.

Decol (1999) analyzes the decline in Catholics and increase in Protestants and people without religious affiliation up to the 1991 Brazilian Census. His attempt deserves tributes due, among other features, to his initiative to stratify the analysis by gender. However, his method is strictly descriptive, and even though carefully applied, he fails to incorporate any further statistical analysis. Apart from that, to the best of our knowledge, no other publication has analyzed whether the trends he observed continued in Brazil after 1991 and what possible differences in population composition could account for the diverging trends.

In order to understand these questions, we applied the Age-Period-Cohort (APC) approach. When changes that take place in a society belong to a specific age group (or groups), the result is an *age effect*, which is aging related developmental changes occurring in the life course. In this case, one would observe that certain age groups, regardless of their birth cohort, share the same characteristics or face the same phenomenon. One example of this could be the increased probability of developing chronic diseases with age when comparing older people with those in younger age groups. When changes occur in all age groups at the same time, this configures a *period effect*, which "reflects changes in social, historical and epidemiological conditions that are unique to a time period that affect all living conditions regardless of age or life stage (Yang, 2011, p. 18)". The economic crisis of 1929 and the terrorist attacks of 2011 are examples of period effects that are likely to affect the society in which they occur as a whole. Finally, *cohort effects* refer to individuals who share some experience, such as year of birth or exposure to an event. In this case, the experiences result from the intersection of age and period (Yang, 2011). According to Ryder (1965), cohorts represent the effect of formative experience. Not only are they shaped by their life conditions from the moment of birth, but they have continuous and shared exposure to historical and social factors that might affect their living

conditions throughout the life course, thus resulting in making that group unique. One example of a cohort effect is the baby boom cohort (born between 1946 and 1964), who have peculiar characteristics that distinguish themselves from the previous and posterior generations (Anisef & Axelrod, 2011).

In the absence of longitudinal data to apply the APC approach, recently developed statistical tools transforms cross-sectional data from census into well-grounded synthetic cohorts that will mimic the true birth cohorts. We applied the Hierarchical Age-Period-Cohort (HAPC) and Cross Classified Random-Effects Model (CCREM) approach which enable us to separate the multiple effects of age, cohort, and period (APC), in the study of religion provides the basis for understanding what lies behind changes in the religious composition of Brazil, not to mention the possibility of going one degree further and observing intra-cohort heterogeneity, concerning sociodemographic variables, such as place of residence and schooling level.

This paper is expected to be divided in six sections, including this introduction. In section two we describe the religious landscape in Brazil since its colonization, identifying factors that may have contributed to changes in the distribution of religious affiliation, and we formulate the hypotheses that we analyzed empirically. Section 3 presents the applied methodology, including a description of the databases, the Brazilian Census from 1970 and 2010, and the econometric models, which are the Hierarchical Age-Period-Cohort (HAPC) and Cross Classified Random-Effects Model (CCREM). Then, we intend to give an overview of the data with descriptive statistics. In section 5 we will present the results of the econometric models. Currently we show some preliminary results with a simpler technique that is the intrinsic estimator. The last section concludes the paper.

2 - THE CHANGING RELIGIOUS LANDSCAPE OF BRAZIL: CONTEXT AND HYPOTHESES

In the following lines we briefly describe the religious panorama in Brazil, including key factors that could have contributed to changes in the distribution of religious affiliation. Along with these key factors, we enumerate the hypotheses that are empirically tested.

2.1 – An overview of the religious panorama in Brazil

Since Portugal initiated the colonization of Brazil, on mid-sixteenth century, Catholicism began to grow roots and religious congregations were part of the life of the Brazilian inhabitants, whether they were native Indians, focus of evangelization, Portuguese migrants, or simply Brazilians: those who needed an institution which could provide them with religious faith and that they could trust their administrative services, which was mostly the Catholic Church (Oliveira, 2008). From the moment of colonization to the proclamation of the republic in 1889, Catholicism was decreed the official religion of Brazil. Moreover, the royalty forbade the entrance and practice of other cults and religions in Brazil (Fragoso, 1994).

The nineteenth century was marked by significant changes in the religious context. French, British, American and German immigrants, among others, brought Protestantism to the country in the beginning in ninetieth century (Oliveira, 2008). Protestant churches were allowed to be built as long as their intention was not to convert the Brazilian Catholics. Anglican communities, Baptists, as well as Presbyterian Church were introduced in the South and Southeast of Brazil.

Classical Pentecostals arrived in the 1910's, but their influence remained restricted to the North of Brazil for many decades. The second stream (also called second-generation Pentecostal) began to emerge in the 1950s, when American missionaries of the International Church of the Foursquare Gospel arrived in Sao Paulo, contributing to the expansion of Pentecostalism in Brazil. Since then, these churches have had the highest growth in affiliations, especially among the poorest people of the country. They are known for promoting poverty and simplicity as virtues, but misery and greed should be avoided, as they originated from the negative influence of the evil brought by capitalism (Burdick, 1993).

The military dictatorship of 1964 resulted in an increase in the conflicts that lasted for several years between church and state, such as harassment, arrest and torture of students, priests and seminarists (Betto, 1982). In 1968 the Basic Ecclesiastical Communities (BEC), a left-wing religious movement linked to social movements, was installed (Mainwaring, 2000).

The Catholic Charismatic Renewal (CCR) appeared in 1960 in the United States and in 1970 in Brazil. This movement stresses the need of the Catholic Church to reorganize and renew the life of the Church by reemphasizing a return to Christian origins, reaffirming the presence of the Holy Spirit, which, according to the charismatic, performs miracles, such as healing the faithful (Chesnut, 1997). The appreciation of the Holy Spirit marks the tendency of homogenization of practices in the Pentecostal and Charismatic churches. During the services, both worshippers dance, read the bible, give great importance to the power of words, preach the commandments, and stress the relevance of values such as virginity until marriage, high attendance at services, and liturgical celebrations. These similarities make them contestants for the same souls and the CCR movement is gaining ground among the middle and lower classes, and among young people (Chesnut, 1997). Because CCR is not a separate category from Catholics in the census categories, we are unable to track changes. Despite the great growth of the Charismatic groups, the Catholic religion has lost sovereignty and is nowadays considered a heterogeneous religion, since it covers both people with high religiosity, as the CCR members, and people with very low religiosity, such as the ones considered nominal Catholics, who pass their denomination from generation to generation, but only to fulfill social expectations or rites of passage (Pierucci & Prandi, 2000 in Verona, 2010).

Considered the third Pentecostal wave, neo-Pentecostalism emerged in the second half of the 1970s in the United States and is noteworthy since the denomination has been the fastest growing in number of churches. Based on the principles of the Theology of Prosperity, it preaches that success, happiness and prosperity can be achieved in this earthly life. They are so called because they differ greatly from the historical Protestant and Pentecostal churches, rejecting traditional uses and customs. They are also more liberal on moral issues and less rigid than traditional Pentecostal churches on the behavior of their member. For instance, they have no clothing codes, such as long skirts and long hair (Chesnut, 1997). Pastors also make use of testimonials to attract more members, and communication campaigns to ensure massive cash donations (Freston, 1993; Chesnut, 1997). Several neo-Pentecostal churches were founded on Brazilian soil and most of them follow the Theology of Prosperity that teaches that prosperity is everyone's right and a sign of faith (Mariano, 2004). According to Chesnut (1997), it is its offensive against poverty that has led to its growing membership.

In 1980 a major economic crisis caused by inflation, political and external debt crisis brought unemployment and poverty in all regions in Brazil (Fernandes & Paes, n/d), and the decade is known as the "lost decade". According to Chesnut (2000), with the increase in crime since the nineties, what particularly touched the Brazilian urban poor neighborhoods, the need for supernatural protection increased. To mitigate the effects of persistent poverty and violence, the church provided material aid, psychological support, and, in some cases, even employment. As a consequence, many low SES individuals were attracted by the Pentecostal and Neo-pentecostal churches. Based on this discussion, we arrive in our first two hypotheses:

Hypothesis 1: Period effects might coincide with the timing of historical changes that have been observed in Brazil. The economic crisis of 1980's which draw a sizable proportion of Brazilians into poverty, the increase in crime and violence in the 1990's, and the crack epidemic of the 2000's caused a major increase in Pentecostalism and Neo-Pentecostalism.

Hypothesis 2: Low education membership in the Pentecostal and Neo-pentecostal churches will be proportionally higher than high education membership.

Interestingly, perhaps as a way to compensate for the subservience in a patriarchal poor violent society, women who are affiliated with Pentecostalism and Neo-pentecostalism report having greater access to the "gifts of the spirit". Chesnut (2000) reveals that many women who are separated or divorced from husbands who maintained extramarital relationships did so after having visions that they were being betrayed. Many husbands even started to avoid this kind of behavior predicting that their wives could, through the "gifts of the spirit", glean a sense of their betrayal. Other domestic and marital problems, like alcoholism and drug use are also "cured" during the meetings and services. Regarding these findings, Hout and Fischer (2002) observed that women had smaller odds than men when it comes to having no religious preferences, which means they are more likely to have a religion. These facts allow us to state another hypothesis:

Hypothesis 3: The spread of Pentecostalism and Neo-Pentecostalism might be stronger for women, especially for earlier periods, and for younger cohorts, at the same time that men may show a higher propensity to "No Religious Affiliation".

According to Verona (2010), the appeal of the pentecostal churches with the Brazilian youth is very strong. The church promotes parties with music, youth meetings, and other activities to increase the social and human capital of teenagers and young adults (Smith, 2003). Youth who live in less priviledged areas report going to church on Saturday night because this is the only thing they can do which is free and close to their homes (Verona, 2010). Hence, follows another hypothesis:

Hypothesis 4: Because of cohort effects, newer cohorts maybe more linked to pentecostals and neo-pentescostals than older ones.

Regarding the differences between Pentecostalism and Neo- pentecostalism, we hypothese that:

Hypothesis 5: Due to a more liberal environment, younger cohorts tend to mention Neo-pentecostalism more often than Pentecostalism.

Regardless of types of change, religion is likely to influence one's view towards the world by sharing symbolic meaning and rituals, and shaping social and political attitudes (Steensland et al. 2000). If religious affiliation is associated with certain attitudes or behavior, such as sexual, reproductive outcome or political orientation, studying the distribution of religious affiliations over time or the dynamics and patterns of religious change and affiliation suggests what to expect in the future, for instance, in terms of political decisions and childbearing. We discuss some of these topics in the next section.

2.2 - Other aspects that might affect the religious panorama in Brazil

Other changes in the Brazilian society likely contributed to the variations in the religious landscape. This is the case of fertility decline, population aging and increase in longevity, increasing levels of education, and urbanization. In the following paragraph, we briefly discuss them.

As fertility rates began to decline in 1960's, older cohorts began to be relatively more numerous than the younger ones, configuring what is called Population Aging. At the same time, life expectancy also increased, contributing for a growing proportion of elderlies. Past studies have shown that older people are more religious than younger ones because the proximity of death and the increased need of social contact after retirement causes an approximation (or re-approximation) of this population with the church, in part, because of the churches role in providing social support and networks for the elderly (Levin, Chatters & Taylor, 2010). Other research suggests a U-curve distribution of high religiosity with age, with people being more religious when they are young, less religious when they are adults, and again more religious as they age (Neuman, 1986).

The shape of the curve might actually vary by religion. The frailty of these cited researches is cofounding aspects of age and cohort effects (Yang et al, 2004). Note that if older cohorts are more religious than younger ones, cross section one-time surveys could inaccurately classify cohort effects as age effects. It is possible that both effects exist. Therefore, we can state the following hypothesis:

> **Hypothesis 6: Due to age effects, net of cohort effects, older individuals might be more religious than younger ones.**

For Hout and Fischer (2002), the increase in education levels was associated with a rise in no religious affiliation. Thus, highly educated individuals might be overrepresented in the no religious group:

Hypothesis 7: Because "No religion" is likely to be linked to other secular, more modern values, it will be more present among highly educated.

A more sociological hypothesis, that of Secularization in which social change related to the decline of the influence of religion in the public sector and social norms of a society is also credited for religious shifts. Thus, Spirituality loses power to rationality and materialism represented by a competitive society with a laic state (Decol, 1999).

However, Hout and Fischer (2002) are surprised to learn that although people do not mention an affiliation, many of them still present religious values, such as belief in God, Heaven, and life after death. Apparently, the growth of people who report themselves no religious appear to be linked to a desire to stretch away from the political parties and organizations that have a conservative agenda. "They expressed little or no confidence in religious leaders and churches, and many saw them as the source of conflict and intolerance" (Hout and Ficher, 2002, p. 178). Common knowledge accept as true that young people in general are more subjected to modernity:

Hypothesis 8: "No religious affiliation" will be more reported by younger generations, representing a cohort effect.

Notice that we proposed two tendencies for the younger cohorts that apparently are contradictory: they might show grater propensity to be linked to Pentecostalism and Neo-pentecostalism and show a lower propensity to be religious. The heterogeneity of the Brazilian population, how religious affiliation appears to different groups of people, whether at different stages in the life course, level of education, gender and geographic location, and time dynamics answer these questions.

This theoretical presentation and the eight hypotheses discussed here are the basis for our empirical analyses. In the next section we present the databases and the empirical strategy we applied.

3 – METHODOLOGY

This section describes the methodology we used to analyses the hypotheses stated previously. First, we describe the databases, which are the Brazilian Cnesis from 1970 and 2010, and the variables. Second, we present the econometric models, more specifically the hierarchical APC and cross classified random-effects model (CCREM).

3.1 – Databases and variables

The 1872 Brazilian Census was the first Census to include a question about religious affiliation. At that time, the religious categories were limited to Catholics, Non-Catholics, and people without religious affiliation. In 1890, three other categories were added: Orthodox Protestants, Positivist Protestants, and other. However, the coverture of the survey is doubtful (Bacellar, Scott, and Bassanezi, 2005). The 1900 and 1920 Censuses did not inquire about religion.

Representative data on religion only became available in the 1940 Census. Hence, since then, researchers were able to investigate historical, cultural and socio-economic changes that took place in Brazil that could have had major implications for the distribution of religious affiliation. In 1940, the category Jewish was added to the list of religions. So, to be precise, the 1940 Census included the following religions: Catholic, Orthodox Protestants, Positivist Protestant (now denominated Pentecostals), Jewish, others and Non-religious. The 1950 and the 1960 Censuses included the denominations Spiritualist, Buddhists, and Maoists. The1970 Census did not incorporate any new religious affiliation. In the 1980 Census, however, the category Neo-Pentecostal was added. Beginning in that year, it is possible to observe the growth of neo-Pentecostals. In the following Census (1991, 2000 and 2010), more refinements were included into the categories. They were further divided into groups of specific churches. These last Censuses present around 100 different categories.

This paper makes an attempt to discuss the changes in distribution of religion affiliation in Brazil during the period between 1970 and 2010 using Census data. Given the data availability presented above, and the relative size of the Brazilian population affiliated to each religion, we analyze the following religions: Mainline Protestants (orthodox Protestants in the later times),

Pentecostals (positivist Protestants in the later times), Neo-pentecostals, Catholics and people without religious affiliation. Notice, however, that "No affiliation" does not necessarily mean "lack of religiosity", or "absence of affiliation", but it might have different meanings. Other groups of the population, such as Other Christian religions, Jehovah witness, Buddhism, Jewish, Muslins and religions originated in Africa and Asia were less numerous and are not included in the analyses.

Moreover, as we analyzed data from 1970 to 2010, one assumption need to be made regarding the use of religious affiliation, that is: religions, their concepts, dogmas and beliefs are belief to be consistent along the years that a person live and along time and shared by everybody at every moment. For instance, being Catholic in 190 is the same as being Catholic in 2010. Hout and Fischer (2002) summarize the importance of having this concept in mind when doing research on religious for a long period of time. "Even if Americans' religious beliefs and practices are stable (…) the symbolic meaning of their religious identities can change" (Hout and Fischer, 2002, p. 188), which means that religious are not the same along time. And they complete "In this case, affirming religion increasingly carries the meaning of being conservative, much more so than in an earlier era" (Hout and Fischer, 2002, p. 188). Thus, the theory of the author says that because being religious used to be the norm but no longer is, those who remain religious affiliated in an era where affiliation is a matter of choice are in fact more religious than the ones who were affiliated decades ago. It may or may not apply for the Brazilian reality.

Another assumption is that there is no religious pluralism and no religious fluidity if not stated by the Census respondent. We assume that the respondent revealed the one that would be considered their main religion, and in case he/she belonged to more than one, we assume that he did not chose "no religious affiliation" as an option.

We selected the individuals with age between 20 and 70 years old in most Census (1970, 1980, 2000 and 2010), but for the 1991 Census, due to this one year shift in the research data, we selected individuals from 21 to 71.

The dependent variable is a categorical variable indicating the individuals' religion or a dummy variable indicating a specific religion. Besides religious affiliations, other variables will be included in the analysis in order to test the cited hypotheses: gender (1 for male, 0 for female),

education (none, less than fundamental, less than high school, high school, and some college), age (continuous), age squared, birth cohort (5-year-interval) and period.

A critical phenomenon that took place in Brazil was the massive urbanization beginning in 1950, when former president Juscelino Kubitschek (1956-1961) incentivated the sectors of transportation and energy, aimed at developing the industry. In 1960, 45% of the population was urban, while in 2010, 84% of the population of Brazil was already residing in urban areas.

Urbanization and social segregations are responsible for the growth of slums, where Catholic Churches have worse penetration. Thus, pentecostals and neo-pentecostal churches, which can operate in any location (including garages) gained importance and are responsible for major conversions, especially among the poorest of the poor, as previous stated (McKinnon, Potter & Garrard-Burnett, 2008; Verona, 2010). However, urabanization also promotes modernization in a tendency contrary to the above. Because the effect of urbanization is blurry, we included a "urban/rural" dummy (1 for urban, 0 for rural).

Moreover, since Brazil is highly regionaly diverse, we included four dummies indicating the individuals's macroregion of residence (North, Northeast, Central-West or South. The Southeast was the reference).

3.2 – Empirical strategy

In the absence of longitudinal data which enables the investigation of religious affiliation for the same individual throughout time and by cohort, we classified the Census data in different five-year-interval birth cohorts from 1900 to 1990 (Mason and Fienberg 1985; Preston, Heuveline, and Guillot, 2001 in Yang Yang, 2011). By doing so, we were able to track more effectively social changes and changes in cultural norms. One of the benefits of the synthetic birth cohort method compared to the longitudinal studies is the fact that it has less problems of attrition across time as in panel studies, and it is nationally representative (Yang Yang, 2011).

A limitation of this paper is that cohorts are synthetic, not truly longitudinal, so people in the cohorts are not the same individuals along the years, however, they are approximately the same. Changes in sex are extremely uncommon. Most household heads 20 years old or over do not change their level of formal education, as we categorized them. Moreover, international

migration might change slightly the Brazilian urban population composition. Inferences will be made based on the assumption that synthetic cohorts "mimic the age trajectories of change within true cohorts" (Yang Yang, 2011, 24).

Due to the linear dependency between age, period and cohort (period = age + cohort), models that incorporate these three variables have problems of identification (Glen, 1979), rendering it difficult to assess the extent to which any behavior reflects age, period, and/or cohort mechanisms. Hence, it is not appropriate the use of Generalized Linear Methods since the results cannot be properly used for statistical inference (Mason and Fienberg 1985 in Yang Yang, 2011).

Yang et al (2004), Fu (2008) and Yang et al (2008) listed several methods that can be used to address these problems, such as the Intrinsic Estimator, which was recently utilized to estimate APC effects on religious activities and beliefs (Schwadel, 2011). In this article, Schwadel examines changes in American's religious service attendance, prayer, belief in the afterlife, and biblical literalism using an APC approach. He concluded that most decline in the four dependent variables cited above are cohort driven, with the exception of the belief in afterlife, which is more constant across periods and cohorts, with no significant age effect.

The Intrinsic Estimator is, however, utilized for calculation of aggregate level data and cannot yield the effect of individual-level characteristics. Another option, Constrained Generalized Linear Methods, implicates in choosing one of more groups to be eliminated from the model "forcing" the data to be independent. The problem is that the coefficients are dependable on the chosen constrains and assumptions of equality between categories (Yang et al, 2004).

Recent analytical advances provide some leverage on these problems and allow for estimation of these sources of variance without imputing constrains (Yang et al, 2008). Thus, in order to capture the effects of APC on religion affiliation with the use of individual's variables, we used in the analysis a Hierarchical APC model for repeated cross-section surveys. Multilevel heterogeneity in the data may underestimate standard errors in a linear model. A cross classified random-effects Model (CCREM) (Yang Yang et al. 2008) is applied to our data with birth cohorts. The model estimates fixed effects for individual-level covariates and estimates random overall effects for period and cohort, and also these same effects for sex and education.

Thus, the CCREM is a mix of fixed and random effects models, can characterize contextual effects of historical time and cohort membership, and can accommodate covariates and the observation of social change. Because they are cross-classified random, it is possible to observe if individuals within the same periods and cohorts share unobserved random variance (Yang Yang, 2011) finding possible heterogeneity inter and intra cohort and period.

Following Yang Yang et al. (2008), the first level of the model is represented by the equation below:

$$Y_{ijk} = \alpha_{jk} + \beta_{1jk}A + \beta_{2jk}A^2 + \beta_{3jk}M + \sum_{z=4}^{8}\beta_{zjk}E_z + \beta_{8jk}U + \sum_{z=9}^{20}\beta_{zjk}R_z + \sum \beta_{mjkm}I_m + e_{ijk},$$

where i represents the individuals, j represents period and *k* cohort, Y is the dependent variable for religious affiliation, A is age, M is the male dummy, E are the categories of education, U is the urban dummy, R are the regional dummies, I are the interactions, α and βs are the estimated coefficients, and e_{ijk} is the random error.

The first equation in the second level of the model is the following:

$$\alpha_{jk} = \pi_0 + \tau_{0j} + \zeta_{0k},$$

where π_0 is the expected mean at the zero values of all level-1 variables averaged over all periods and cohorts, τ_{0j} is the overall *period effect* in terms of residual random coefficients of period *j* averaged over all birth cohorts, and ζ_{0k} is the overall *cohort effect* in terms of residual random coefficients of cohort *k* averaged over all time periods.

We also incorporate two other equations in the second level, which are similar to the above one:

$$\beta_{ijk} = \pi_i + \tau_{ij} + \zeta_{ik},$$

where i = 3 or 4-7, π_i represent the fixed effects of sex or of education, τ_{ij} and ζ_{ik} are respectively the period effect and cohort effect of these variables.

In order to assess goodness of fit, the Bayesian Information Criterion (BIC) statistics will be used to compare nested and non-nested models (Yang Yang, 2011). In the BIC statistics, "(…) inferences about every parameter fully account for the uncertainty associated with all others" (Yang Yang, 2011, p. 24).

4 – PRELIMINARY DISCUSSION

The objective of this paper is to analyze Age Period and Cohort effects in religious affiliation looking for patterns of changes that could be explained by the eight hypotheses hereby specified. The results came as expected and the hypotheses listed in the article were either confirmed or partially confirmed in a preliminary analysis with the Intrinsic Estimator, raising other questions that could not be answered by this method convincingly.

Period effects for Pentecostalism and Neo-Pentecostalism affiliations for all age groups could in fact be linked to the economic crisis of 1980's. However, the hypothesis that younger cohorts tend to mention pentecostalism or Neo-pentecostalism more often than older cohorts is only partially confirmed.

Affiliation of women and low educated is proportionally higher than that of males as expected. No important effect of gender was found in no-affiliation, with the exception of the fact that women tend to report more affiliation of any kind and no affiliation more often than men. The gender discrepancy certainly also deserves further exploratory research in order to clear out possible spurious effects that are not gender related.

In regards to the No-affiliated, younger age groups tend to mention no religious affiliation more often than their elder counterparts, but there is also a cohort effect, since "No religious affiliation" is more reported by younger generations, with increasing trends.

Finaly, religious affiliation seem not have a definite stratification by education as suggested in the hypotheses, however, these finds confirms that there might be differences

regarding education patterns and religious affiliations, and sets the base for new studies that should investigate other covariates and maybe other level of education different from college degree.

Some limitations of this paper should be acknowledged, especially regarding the validity of religious affiliation as the dependent variable. We tested changes in religious affiliation, not in religiosity, since there is not a single variable in the Brazilian Census that could attest for religiosity, such as church attendance or other measurements of religious salience. That being said, assessing whether people become more religious with age or along the years was not the aim of this study, but simply to state whether there was an increase in probabilities of having reported a religious affiliation with age or with time.

Separating the effects of cohort, age and period is insightful to understand the changing panorama of religious affiliation in Brazil. Moreover, with refinements, we challenged previous assumptions that the reality of changes applies to the Brazilian population as a whole and strength the hypothesis that such a diverse country is the stage for multiple realities.

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