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CHURCH TAX, CHURCH DISAFFILIATION, AND VOLUNTARY GIVING

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LIST OF SYMBOLS

Symbol	Meaning
$\mathbf{1}(.)$	indicator function
a	fitting parameter concerning the church's use of tax revenues
b	fitting parameter concerning the state's use of tax revenues
b_t	saving/dissaving in period t
c	random number
C	secular consumption
$C^*(.)$	conditional indirect demand function for the consumption bundle C
C_t	secular consumption in period t
D_M	binary variable indicating church membership status
$D_{M,0}$	binary variable indicating original church membership status
D^{rel}	indicator variable indicating that the church receives tax
D^{sec}	indicator variable indicating that the state receives tax
d	observable binary outcome variable
d^*	latent (unobservable) variable
$\mathrm{E}(.)$	expected value
e	fitting parameter
$F(.)$	production function of religious human capital
$f(.)$	density function
$G(.)$	probability distribution function
$G'(.)$	probability density function
g	charitable giving
g^*	desired level of charitable giving
g_R	effective religious giving
g_S	effective secular giving
H	total time endowment
h_C	time spent with secular consumption activities
h_{Ct}	time spent with secular consumption activities in period t
h_R	time spent with religious activities
h_{Rt}	time spent with religious activities in period t

h_R^A	time with private religious activities like worship and prayer
h_R^V	time spent with religious volunteering
h_S	time spent with secular volunteering
I_1^a	utility level if afterlife exists and individual is religious
I_2^a	utility level if afterlife does not exist and individual is religious
I_1^n	utility level if afterlife exists and individual is not religious
I_2^n	utility level if afterlife does not exist and individual is not religious
i	interest rate
j	index of individual i
k	fixed (monetary) costs of being religious/being a church member
L	Lagrangian function
l	number of hours worked
l_t	number of hours worked in period t
m_C	monetary resources spent for secular consumption activities
m_{Ct}	monetary resources spent for secular consumption activities in period t
m_R	monetary resources spent for religious activities
m_{Rt}	monetary resources spent for religious activities in period t
m_S	monetary resources spent for secular charitable activities
m_{St}	monetary resources spent for secular charitable activities in period t
N	number of members in the religious community of individual i
n	total number of time periods in individual's life
P	probability
$\mathrm{P}(.)$	probability function
$P(A)$	(subjective) probability that an afterlife exists
$P(B)$	(subjective) probability of having the "correct" religion
$P_t(D)$	probability of death at the beginning of period t
$P(N;N)$	probability of going to heaven if individual is not religious in periods 1 and 2
$P(N;R)$	probability of going to heaven if individual is not religious in period 1, but religious in period 2
$P(R;R)$	probability of going to heaven if individual is religious in periods 1 and 2

$P(R;N)$	probability of going to heaven if individual is religious in period 1, but not in period 2
p	price of giving
p_C	price of consumption good
p_M	price of church membership
q_t	group quality in period t
R	religiosity
R_A	afterlife consumption
R_t	religious consumption in period t
R_t^{-i}	religious consumption of all individuals except individual i in i's religious community in period t
S	secular charitable activity
s_{Rt}	stock of religious capital in period t
$T(.)$	church tax scale
t	time period
$U(.)$	utility function
$\widehat{U}[.]$	conditional indirect utility function
U_{memb}	utility from church membership
$u(.)$	additive part of utility function
V	church disaffiliation decision (binary, observable)
V^*	utility difference between being a church member and not being a church member (unobservable)
$v(.)$	additive part of utility function
w	exogenously determined hourly wage
w_t	hourly wage rate in period t
X	individual characteristics
$\boldsymbol{x}$	vector of regressors (in second tier)
x_j	element of vector $\boldsymbol{x}$
y	exogenously determined income
y^*	critical income level
y_t	exogenously determined income in period t
$\tilde{y}$	exogenously determined non-labor income
$\tilde{y}_t$	exogenously determined non-labor income in period t

y^s	income after income tax
z	index of time t
$\boldsymbol{z}$	vector of regressors (in first tier)
z_j	element of vector $\boldsymbol{z}$
$\boldsymbol{\alpha}$	coefficent vector (in second tier, if two-tier decision)
α_j	element of vector $\boldsymbol{\alpha}$
β	parameter of the Cobb-Douglas utility function
β_1	parameter of the Cobb-Douglas utility function determining the marginal utility derived from religious contributions
$\widehat{\beta_1}$	critical level of β_1 with respect to corner solution
β_2	parameter of the Cobb-Douglas utility function determining the marginal utility derived from secular contributions
$\boldsymbol{\gamma}$	coefficient vector (in first tier)
γ_j	element of vector $\boldsymbol{\gamma}$
Δ	transaction costs
Δ_j	transaction costs of church (re-)affiliation
Δ_l	transaction costs of church disaffiliation
δ_t	discount factor in period t
ε	error term
ξ	share of secular consumption utility that is paid as a price for being religious
θ	parameter of the utility function determining the marginal utility of prestige
θ_1	parameter of the utility function determining the marginal utility of prestige derived from religious contributions
θ_2	parameter of the utility function determining the marginal utility of prestige derived from secular contributions
λ	Langrange parameter
$\lambda(.)$	inverse Mill's ratio
μ_t	marginal tax rate in period t
π_t	probability of survival until the beginning of period t
ρ	correlation coefficient
σ	standard deviation

σ^2	variance
τ	tax rate in the church tax resp. tax assignment system
τ^k	church tax rate on income tax
τ^s	average income tax rate
$\varphi(.)$	probability function of the standard normal distribution
$\boldsymbol{\Phi}(.)$	distribution function of the standard normal distribution
ω	Bernoulli-distributed variable
ass_tax (superscript)	variable refers to tax assignment system
$bench$ (superscript)	variable refers to the benchmark solution
$chur\_tax$ (superscript)	variable refers to the church tax system
$corner$ (superscript)	variable refers to corner solution
i (superscript)	variable refers to the individual (only where necessary)
hu (superscript)	variable refers to husband
$regular$ (superscript)	variable refers to regular (non-corner) solution
vol (superscript)	variable refers to the voluntary giving system
wi (superscript)	variable refers to wife
M_0 (subscript)	variable refers to the case when individual is no church member
M_1 (subscript)	variable refers to the case when individual is church member
$corner$ (subscript)	variable refers to corner solution
pre (subscript)	variable refers to the prestige model
$regular$ (subscript)	variable refers to regular (non-corner) solution
rel (subscript)	variable refers to the case when individual assigns taxes to the state
sec (subscript)	variable refers to the case when individual assigns taxes to the church

ABBREVIATIONS

Abbreviation	Meaning
coeff.	Coefficient
CRO	Civil registry office
DC	District court
EKD	*Evangelische Kirche in Deutschland* (Evangelical Church in Germany)
EStDV	*Einkommensteuer-Durchführungsverordnung* (Ordinance Regulating the Income Tax Law)
EStG	*Einkommensteuergesetz* (Income Tax Law)
EU	Expected utility
FRG	Federal Republic of Germany
ITL	Income Tax Law
MP	Marginal productivity
MRS	Marginal rate of substitution
MRT	Marginal rate of transformation
MRTS	Marginal rate of technical substitution
MU	Marginal utility
ref.	Reference category
SolZG	*Solidaritätszuschlagsgesetz* (Law on Solidarity Surcharge)
std. dev.	Standard deviation

1 INTRODUCTION

At the level of individuals and households, economic behavior and outcomes do *correlate with religion.*

Iannaccone, 1998: 1475 (emphasis in original)

Since the seminal work of Max Weber, "The Protestant Ethic and the Spirit of Capitalism" (1905 [1958]), there has been a large interest in the effects that religion has on individual behavior and, more recently, on the collective performance of societies. Researchers have examined, among others, religion's effect on economic, demographic and pro-social behavior, as well as on values and happiness, and have predominantly credited religion with favorable outcomes.

Besides religiosity, religious institutions shape the social and political sphere of a country. Taking the example of Germany, the two dominant churches, the Protestant Church called "Evangelical Church in Germany" (EKD) and the Catholic Church, are not only the largest providers of welfare services such as kindergartens, hospitals and elderly care facilities, they are also the second largest employer in the country (only surpassed by the state). They finance themselves predominantly by church taxes that are imposed on their members and amounted to more than 9 billion euro in 2011.

Against this background, the constant and quantitatively significant loss of members of these two churches should be of considerable interest to economic research. In fact, in 1956 only 4 % of the (West) German population did not belong to one of the two major churches, while this share has risen to 41 % in 2011.

The aim of this dissertation is to shed some light, both from a theoretical and from an empirical perspective, on the causes of the membership loss of the two large churches in Germany, the Catholic Church and the Evangelical Church in Germany, and to examine the consequences, specifically in the field of voluntary giving. I pay particular attention to the church financing system, which can be expected to exert a significant influence on the church membership decision. In addition, when church membership has pecuniary consequences for the members, it can also be expected to be interrelated with other financially relevant behavior such as making donations.

Before I explain the outline of this work and the research questions in Section 1.4, I motivate my work with a short review of the issues raised above: the literature on the economic effects of religion is reviewed in Section 1.1, the economic and social importance of the two main Christian churches in Germany is discussed in Section 1.2, and the membership change in those churches is the focus of Section 1.3.[1]

[1] For a more profound analysis of church financing systems, in particular the church tax system in Germany, the reader is referred to Section 2.4.

1.1 A brief literature review on the economic effects of religion

McCleary and Barro (2006a: 51) distinguish two paths through which religion can influence outcomes: "religious beliefs" and "networking associated with attendance at formal religious services". Both factors affect the costs and benefits of individual behavior (see Höhener and Schaltegger, 2012: 396). Beliefs in the afterlife, heaven, and hell require the consideration of a (possibly very large) afterlife utility or disutility in the decision making of an individual. If religion is seen as a "social club" (McCleary and Barro, 2006a: 51), the consequences of individual behavior on club membership and the status within the club need to be taken into account. In the words of Lehrer (2011: 39): "The economic perspective views an individual's religious affiliation as affecting economic and demographic behavior because the norms and teachings of various faiths influence the perceived benefits and costs of numerous decisions that people make over the life cycle."

The economic consequences of religion can be measured both at the individual and the social level. Effects at the social level arise either through the concurrence of individual effects or through effects on the cooperation between individuals (Höhener and Schaltegger, 2012: 395-396).

Lehrer (2011: 40) reviews studies from the US which look at denominational differences in demographic behavior and human capital. She concludes that some groups such as conservative Protestants or Jews differ from mainline Protestants in fertility levels, age of marriage, educational attainment and family wealth. She further reports that individuals without a religious affiliation show higher marriage instability and a lower level of education (Lehrer, 2011: 40-41). A high level of religiosity is linked to less drug use, less youth delinquency and a higher educational attainment (Lehrer, 2011: 41).

Other literature reviews on the economic outcomes of religion, such as Iannaccone (1998) and Gruber (2005), support Lehrer's (2011) conclusions about religion's effect on family formation, crime and drug use. Iannaccone (1998: 1476-1477) additionally emphasizes that religion is found to positively influence mental and physical health, and life satisfaction. Gruber (2005) also stresses the positive effects of religion on health, well-being and earnings as well as the depressing effect on deviant behavior. Höhener und Schaltegger (2012: 397-398) distinguish four large areas in which religion matters for individual behavior: education, labor supply and income; deviant behavior; values; and life satisfaction. Steiner, Leinert and

Frey (2010: 16-18) review the literature on the impact of religion on happiness and well-being in some detail. They conclude that both religious beliefs and religious participation positively affect well-being. In addition, there might be denominational differences, with Christianity being particularly beneficial for well-being.

Guiso, Sapienza and Zingales (2003) test the influence of religion on economic attitudes with a large cross-country survey data set. They find that "[r]eligious people trust others more, trust the government more, are less willing to break the law, and believe more in the fairness of the market" (Guiso, Sapienza and Zingales, 2003: 249). In their research, they distinguish between atheist, non-religious and religious people. When looking more closely at religious people, they find that both religious upbringing and religious participation matter, but the two aspects can differ in their importance for each value and attitude. This result disaccords with McCleary and Barro (2006a), who claim that only beliefs, but not participation, matter for the effects of religion. The findings of Guiso, Sapienza and Zingales (2003) also contradict Iannaccone (1998: 1477), who claims that religion has no effect on attitudes towards economic institutions.

Steiner, Leinert and Frey (2010) investigate the impact of religion on happiness in Switzerland. They find that Protestants and Catholics are happier than people without religious affiliation.[2] The positive effect for Protestants remains even after controlling for church attendance, which itself promotes well-being. In contrast, there appears to be no significant impact of the frequency of prayer on happiness. Clark and Lelkes (2009) examine if there are spill-over effects of the religiosity of one individual on the life satisfaction of another person. They find that in Europe people are happier when the share of individuals of their own denomination in their region rises. Protestants are also happier when they are surrounded by a high share of Catholics. However, all individuals report lower life satisfaction when the share of not religiously affiliated individuals in their region is high. This is even true for the non-religious themselves.

One explanation for the higher life satisfaction of religious individuals could be the "[s]tress-buffering effects from religion" (Clark and Lelkes, 2005: 14). In particular, individuals who consider themselves as belonging to a religion experience a smaller drop in life satisfaction when they are unemployed than the non-religious. The research of Dehejia, DeLeire and Luttmer (2007) confirms the results of Clark and Lelkes (2005) by showing that religious participation dampens the psychic cost of negative income shocks. Apart from psychological

[2] Adherents to other religions are excluded.

effects, religion might also have tangible effects for the individual. Dehejia, DeLeire and Luttmer (2007) find that the more someone gives to a religious organization, the more he or she can insure consumption against income shocks.

If individuals can insure themselves through religion, then being religious might also affect opinions on welfare spending and income redistribution. Scheve and Stasavage (2006) use individual data from various countries to test if there is a connection between the frequency of church attendance and preferences for social spending. Both for the whole sample and for Germany as an individual country the authors find that religious attendance reduces the support for government spending for the unemployed, the sick and the old. Neustadt (2011) tests in an experimental setting whether religion influences preferences for redistribution. He finds that Catholics and Protestants demand less redistribution than the non-affiliated. However, the hypothesis that individuals with stronger beliefs in God have a lower willingness to pay for redistribution cannot be supported.

A possible reason for the insurance effect of religion could be that members of a religious community receive (material) support from their church and their fellow believers. This fits with the frequent observation that individuals who are church members or attend church frequently give more freely, both to religious and secular causes. A literature review by Bekkers and Wiepking (2007: 5-6) reveals that the overwhelming majority of studies support this result, while only few present contradictory evidence.

To sum up, there is a considerable body of research that suggests that religious and non-religious individuals differ in their values and preferences, e.g. their attitudes towards the government and social spending. Such differences in individual preferences should also translate in collective economic outcomes that are then expected to vary between regions which differ in the religiousness of their inhabitants.

Therefore a strand of the research looks at religion and its economic effects at the social level. A well-known paper in this regard is McCleary and Barro (2006a), who aim to explain GDP growth in a country with the average beliefs in hell, church attendance and the share of different denominations in that country. They find that wide-spread beliefs in hell, heaven, or the afterlife positively affect economic growth, while a higher average attendance has a negative influence. These findings foster their conviction that beliefs are the factor that matters for economic outcomes, while religious participation is merely a waste of resources unless it helps to strengthen beliefs (McCleary and Barro, 2006a: 68). Lipford and Tollison

(2003) look at the share of church members in US states and use them to explain the per capita income in these states. They find that religious participation and income simultaneously affect each other: being a church member negatively affects income, while a high income disincentivizes religious participation. Scheve and Stasavage (2006) test hypotheses relating the religiousness of a country to its social security spending. They find that there actually exists a negative connection between the average importance of God and church attendance, and social security spending as a percentage of GDP. This suggests that the capacity of religiosity to insure against adverse life events, which researchers find at the individual level, also has consequences for society as a whole.

The effect of religion is not limited to economic outcomes. MacCulloch and Pezzini (2002) test the effect of religion on revolutionary tendencies. They find that in general people who identify themselves as belonging to a religion are less supportive of a revolt in their countries than people without religious affiliation. The dislike for revolution is particularly high for Christians who live in "free" countries, while Muslims who live in "unfree" countries are even more likely to have a taste for revolt.

This brief literature review suggests that religion has a large influence on economic and demographic behavior, such as fertility rates, deviant behavior, health and income. It is also an important predictor of life satisfaction and of a broad range of economically relevant values and attitudes, e.g. income redistribution or trust in institutions. These effects on the micro level impact on the macro level where religion has been associated with income and GDP growth, tastes for revolution and government spending.

However, the literature reviewed so far is quite heterogeneous in how it measures religiosity. Some studies use the denomination, others rely on measures of belief (in God, heaven, hell, the afterlife, etc.) or on the frequency of church attendance. There is some dispute as to which of these measures best captures the "real" mechanism through which religion unfolds its effects on individuals and society as a whole. While McCleary and Barro (2006a: 68) argue that only beliefs are important for economic outcomes, whereas attendance is not, Dehejia, DeLeire and Luttmer (2007: 276) argue that for their outcome of interest – the insurance of happiness against income shocks – participation is necessary, "just believing is not sufficient".

An indicator of religiosity that has rarely been used so far is formal church membership, which will be the focus of my research. Formal church membership does not necessarily

coincide with religious beliefs and religious participation; therefore it is difficult to assess the relevance of the aforementioned studies in the context that I am interested in – the steady decline in formal church membership in Germany.

However, even if the correlates of religiosity were completely independent from formal church membership, the drop in membership numbers would still be expected to have an effect at the social level. What the above research disregards almost completely is that churches are institutions which often have a large influence on society, not only by shaping the values and preferences of their members, but also by being an employer, a social welfare provider, and by commenting on relevant social debates. In Germany this is certainly the case. Moreover, in Germany the power of churches significantly depends on membership numbers, since these determine the revenues of the churches.

1.2 The social relevance of the two major churches in Germany

The two major churches in Germany taken together are the second largest employer in the country, only surpassed by the public sector (Schipper and Budras, 2012). In the institutional church there are about 150,000 employees in the Catholic Church (Sekretariat der Deutschen Bischofskonferenz, 2012: 11) and 223,000 in the Protestant Church (Kirchenamt der EKD, 2012: 21). In addition, roughly 560,000 people work for "Caritas" (Deutscher Caritasverband e.V., 2012: 7), the welfare association of the Catholic Church in Germany, and 453,000 people work for the Protestant welfare association "Diakonie" (Diakonisches Werk der Evangelischen Kirche in Deutschland e.V., 2011: 3). Taken together the two large churches have almost 1.4 million salaried employees.[3] There are also a large number of volunteers: the Protestant Church claims to have 1.1 million people volunteering (Kirchenamt der EKD, 2012: 21), the Catholic Church estimates the number of volunteers to be 600,000 (Sekretariat der Deutschen Bischofskonferenz, 2012: 11).

Churches also contribute to conserve the cultural heritage in Germany. The Evangelical Church in Germany owns roughly 21,000 churches and chapels of which 16,600 are under monumental protection (Kirchenamt der EKD, 2012: 35). The Catholic Church reports that 23,000 of their 24,500 churches are under monumental protection, plus an additional 40,000 other buildings. Sustaining these buildings costs the Catholic Church 418 million euro each year, and the state contributes less than 5 % of the costs (Sekretariat der Deutschen Bischofskonferenz, 2007: 2-3). The Evangelical Church in Germany reports that the maintenance of buildings amounts to 11 % of its total expenditures (Kirchenamt der EKD, 2012: 35). Both churches claim that they find it increasingly difficult to raise the financial means which are necessary to maintain these buildings in the face of declining membership numbers.

An important field of activity of churches are the welfare services they provide. In Germany, the principle of subsidiarity is of high importance (Leis-Peters, 2010: 97), which states that help should be provided at the level closest to the citizen, and if possible by social groups instead of the government. In the welfare sector, this task is mainly assumed by six welfare associations, of which Diakonie and Caritas are the largest ones. They offer a variety of services, in particular for the sick, the elderly, the handicapped, families, children and

[3] The data is the latest data available, but it does not always refer to the same base year.

adolescents, and people in special situations, such as the unemployed, the poor, the homeless and addicts (see Diakonisches Werk der Evangelischen Kirche in Deutschland e.V., 2011). To give only a few examples: of the almost 52,000 day-care facilities for children in Germany which existed in 2012, more than 26,000 (50.3 %) were run by one of the six welfare associations. Caritas and Diakonie together were running 17,855 facilities (34.4 % of all facilities) (Statistisches Bundesamt, 2012c: 12). Of the 1,758 general hospitals that existed in Germany in 2010, 644 belonged to not-for-profit private owners *("freigemeinnützige Trägerschaft")*, of which 161 were run by Diakonie and 329 by Caritas.[4] In the field of elderly care there were 10,384 in-patient facilities offering long-term care in Germany in December 2009, of which 5,632 were run by not-for-profit private owners. Caritas provides 1,309 such facilities, Diakonie 1,582. The number of available beds in in-patient facilities was roughly 819,000; Caritas reports providing 112,000 beds, Diakonie 135,000 — which means that around 30 % of all beds are provided by the two church welfare associations.[5] In the field of youth welfare services the share of the religious welfare associations is also roughly 30 %. Of the 316,000 places offered in this field in Germany in 2010, 47,000 were provided by Diakonie and bodies connected to the Protestant Church and 49,000 were provided by Caritas and other Catholic bodies (Statistisches Bundesamt, 2012b: 19-20). However, if one only looks at children's homes, the share of places provided by church welfare associations is above 50 %.

This short overview illustrates that the welfare services provided by the two large churches in Germany are quantitatively important. Moreover, they are seen as a core activity of churches. 43 % of Protestant church members in West Germany and 54 % in East Germany say that the support that the church provides to the poor, the elderly and the sick is one of the reasons why they are church members (Schloz, 2006: 61). Both church members and non-members expect the church to help people in need and care for the old, the sick and the handicapped. This

[4] Data concerning the total number of general hospitals refers to December 31st, 2010 and is taken from Statistisches Bundesamt (2011b). The number of general hospitals run by Caritas refers to the same date and is taken from Deutscher Caritasverband e.V. (2012: 1). The number of hospitals run by Diakonie refers to January 1st, 2010 and is taken from Diakonisches Werk der Evangelischen Kirche in Deutschland e.V. (2011: 6).

[5] Data concerning the total number of facilities and beds refer to December 15th, 2009 and are taken from Statistische Bundesamt (2011c). By "in-patient facilities offering long-term care" I refer to the German term *"Pflegeheim mit vollstationärer Dauerpflege"*. The number of beds includes both long-term and short-term *("Kurzzeitpflege")* in-patient care. Data for Caritas are taken from Deutscher Caritasverband e.V. (2012: 3) and refer to December 31st, 2010. I report results for *"Vollstationäre Altenpflegeeinrichtung mit Versorgungsvertrag nach §72 SGB XI"*. The number of beds additionally includes beds in *"Kurzzeitpflegeeinrichtung (solitär)"*. Data for Diakonie refer to January 1st, 2010 and are taken from Diakonisches Werk der Evangelischen Kirche in Deutschland e.V. (2011: 26). In order to arrive at the number of facilities I added the two types of in-patient facilities reported in the statistic. The number of beds is the number of beds in those two types of in-patient facilities and beds in short-term care facilities.

aspect is ascribed almost the same importance as celebrating religious services and church festivities (weddings, funerals, etc.) (Pittkowski, 2006: 107). However, while many church members also agree that the church should contribute to the education of children, the agreement among non-members is considerably lower (Pittkowski, 2006: 107-108).

Diakonie and Caritas are also well-known among the German population and have a good image. A study by Diakonisches Werk der Evangelischen Kirche in Deutschland e.V. (2006) found that in 2005 94 % of the German population knew Caritas and 82% knew Diakonie. Seventy-three percent of the respondents found that Caritas should be supported, while 58 % agree that Diakonie is worthy of support. 71 % said that Diakonie has a good or very good image in society.

Considering the important tasks of religious communities, it seems likely that a considerable drop in church membership also affects the ability of churches to carry out these activities and the acceptance of religiously affiliated social welfare providers. First, it reduces the potential number of volunteers in the church, since recently only 3 % of people who volunteer for the church are non-members (Grosse, 2006: 9). Second, it complicates the process of finding highly skilled employees, since it is often still a requirement to be a church member in order to be allowed to work for the institutional church or one of their welfare associations (Oelschlägel, 2008: 257-258). Third, religious organizations might retreat from running particular services because they do not have the financial means to sustain them when a decrease in membership also leads to a decrease in church tax revenues (Leis-Peters, 2010). In some cases, the lack of religious facilities might force the state to step in. In order to see if this is the case, it is instructive to compare East and West Germany. In East Germany, the share of church members in the population is much lower than in West Germany. Consequently, one would expect that there are fewer facilities run by the church, especially when the facilities (such as kindergartens) are (partly) financed through the churches' own financial means.[6] Unfortunately, the data available at the level of the Länder only distinguishes between public and non-public ownership of facilities, but says little about the share of religiously affiliated facilities. However, when looking at day-care facilities for children, one can at least suspect that the share of church welfare organizations is smaller in East Germany than in West Germany. While in West Germany 31.7 % are public, the share is 44.5 % in East Germany

[6] According to Frerk (2005), churches do not use any of their own financial means to run hospitals, elderly care facilities or youth welfare services (with the possible exception of counselling), since these services are financed through social insurance and government grants. In contrast, they do use some of their revenues to finance church-run kindergartens.

(Statistisches Bundesamt, 2012c: 65). Although the share of religiously affiliated day-care facilities is not reported, it seems unlikely that it is higher than in West Germany. Similarly, in East Germany 28 % of general hospitals are run by private not-for-profit organizations and 35 % are public, while in West Germany 38 % have private not-for-profit ownership and 31 % are public (Statistisches Bundesamt, 2013a).[7,8] In sum, in East Germany some welfare services – but not all – are provided to a lesser extent by churches and to a greater extent by the state. Nevertheless, even in largely unchurched East Germany churches and their welfare associations play a prominent role in the provision of welfare services.

Apart from the potential difficulties of maintaining this huge number of services financially, a large share of non-members might also undermine the acceptance of church-run services (Gabriel, 2007: 77). A survey by the Protestant Diakonie found that between 2001 and 2005 the desirability of the Christian background of its services has dropped from 52 % to 46 %. Among the younger cohorts (aged 18 to 39) only one third of the respondents found the Christian background desirable (Diakonisches Werk der Evangelischen Kirche in Deutschland e.V., 2006: 21-26). Recently, the high importance of Christian welfare services, especially hospitals, was critically discussed in the German media because a young woman was denied some treatments in two church-run hospitals in an emergency situation because the treatment was not acceptable from a religious (Catholic) point of view. Such a case illustrates the dilemma that the decline in (Christian) church membership poses for the German welfare state. On the one hand many welfare services are organized in such a way that private not-for-profit providers have priority over public providers, which increases the variety of these services and makes it easier for people to find one that best fits their needs. On the other hand, with a growing number of non-members it is important to make sure that those who do not appreciate the Christian profile of welfare services can find an alternative.

[7] The remaining hospitals are run by private for-profit organizations.

[8] Concerning other types of welfare services, such differences between East and West Germany do not exist. Frerk (2005: 151) shows that after German reunification the structure of elderly care facilities has rapidly changed in East Germany. In 1991 almost 80 % of places in elderly care belonged to public providers (West Germany: 20 %), by 2001 the share of public providers had dropped to 15 % (West Germany: 11 %), while the share of private not-for-profit providers has risen to 64 % (West Germany: 62 %). The situation today resembles that of 2001: there is no systematic difference in the shares of these providers between East Germany and West Germany (Statistisches Bundesamt, 2013b: 6). There is no information about the share of religiously affiliated organizations among the private not-for-profit providers. In the provision of youth welfare services, the situation is similar: private organizations have about the same share in East and West Germany (Statistisches Bundesamt, 2012b: 93-104).

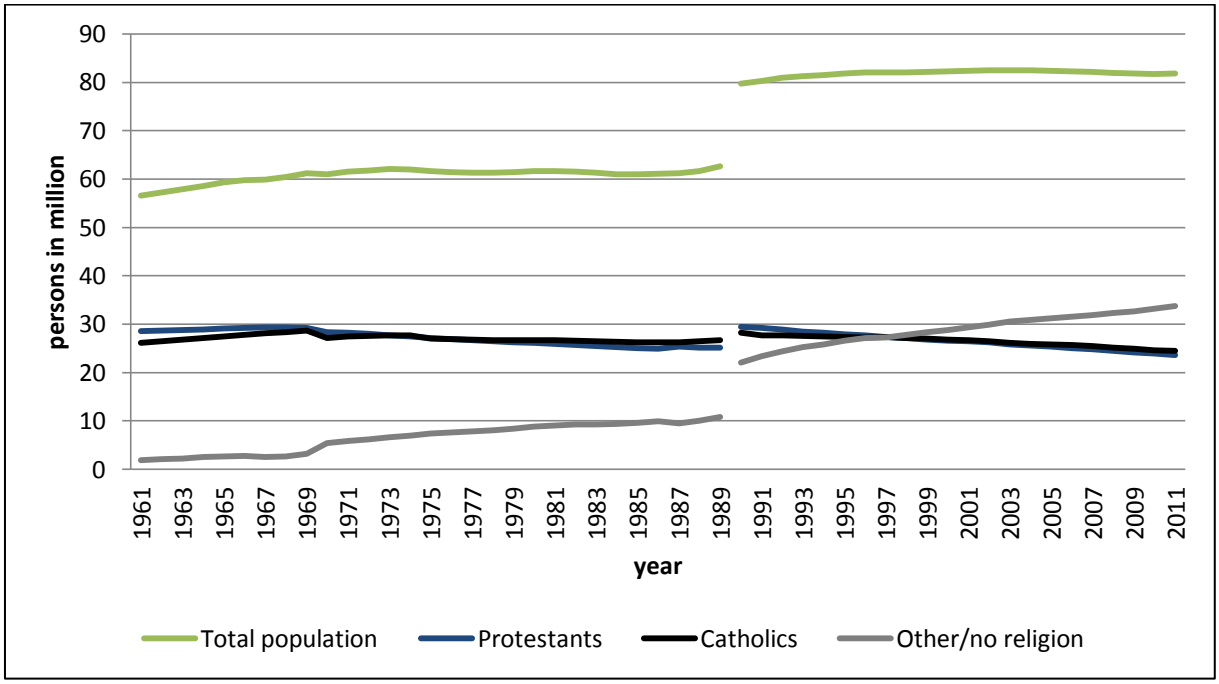
1.3 The development of church membership numbers in Germany

The religious composition of the German population has changed significantly in the last 50 years. While the membership of the two major churches in Germany, the Evangelical Church in Germany (EKD) and the Catholic Church, has decreased almost constantly since around 1970, the number and share of persons who have another or no religion has steadily increased. Figure 1.1 shows the development of the number of people in Germany who are members of the Evangelical Church in Germany, the Catholic Church or none of these two.

Figure 1.1 shows that in 1961 there were slightly more Protestants (28.5 million) than Catholics (26.2 million) living in the Federal Republic of Germany.[9] The number of individuals who did not belong to either of the two Christian churches was negligible (1.9 million). Until roughly 1970, the membership of all three groups was growing, as was the size of the total population in Germany. The Catholic Church gained more members than the Protestant Church, partly because more children were baptized in the Catholic Church and because migrants to Germany were more often Catholic than Protestant. Since 1968 (Protestant Church) and 1973 (Catholic Church) both churches have constantly lost members while the number of inhabitants with another or without religious affiliation has grown rapidly. The membership decline is faster in the Protestant than in the Catholic Church. In the 1980s, there were more Catholics than Protestants in Germany and the number of others (i.e. with another or without religious affiliation) surpassed 10 million. With German reunification, the number of inhabitants of the Federal Republic of Germany increased from 62.7 to 79.8 million. The majority of the new inhabitants (the former inhabitants of the German Democratic Republic) did not belong to one of the two large churches. Although only 21 % of the German population lived in East Germany in 1990, roughly half of all citizens without affiliation to the two large churches in re-united Germany were East Germans. The Protestant Church could also significantly increase its membership and once again had more members than the Catholic Church, which hardly had any members in the former GDR. Since 1990, the trends of the 1970s and 1980s continue: both large churches constantly lose members, the rate of decline is higher for the Protestant Church, and the "other" group grows constantly. Since 1998, citizens who do not belong to any of the two major churches form the largest of the three groups and the Catholic Church again has more members than the Protestant Church.

[9] Reliable data for years before 1990 is available only for the Federal Republic of Germany.

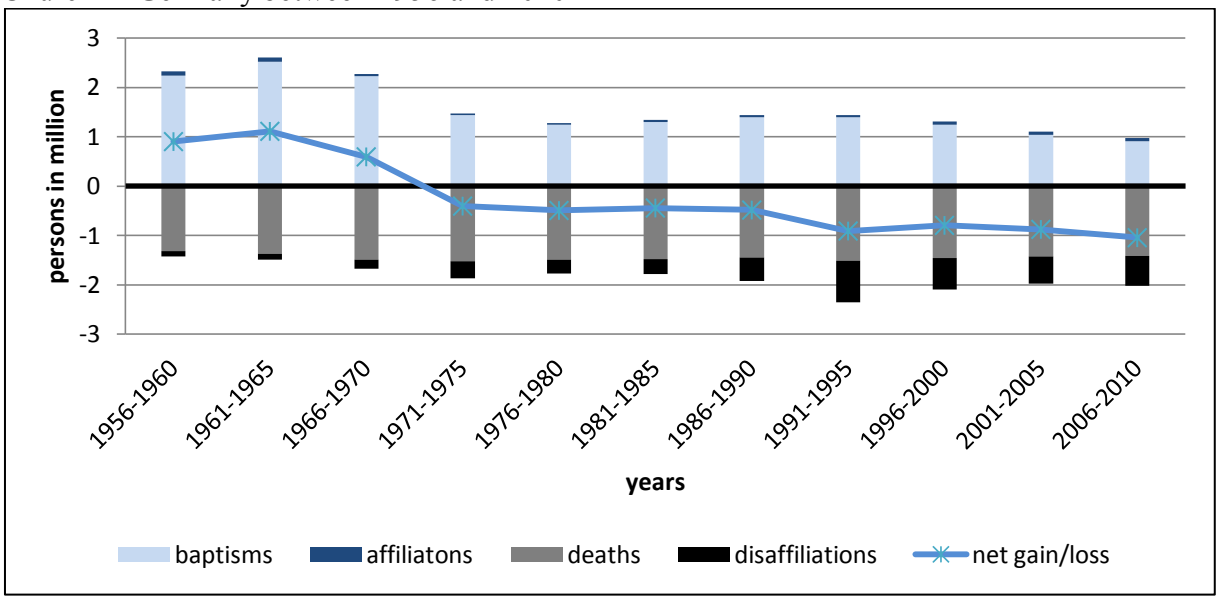
Figure 1.1: Total population, Protestants, Catholics and others in Germany between 1961 and 2011



Data sources: Eicken and Schmitz-Veltin (2010: 589), Statistisches Bundesamt (2011d, 2012d), Sekretariat der Deutschen Bischofskonferenz (2012), EKD (2012).
Note: Data for years before 1990 refer to the former FRG only.

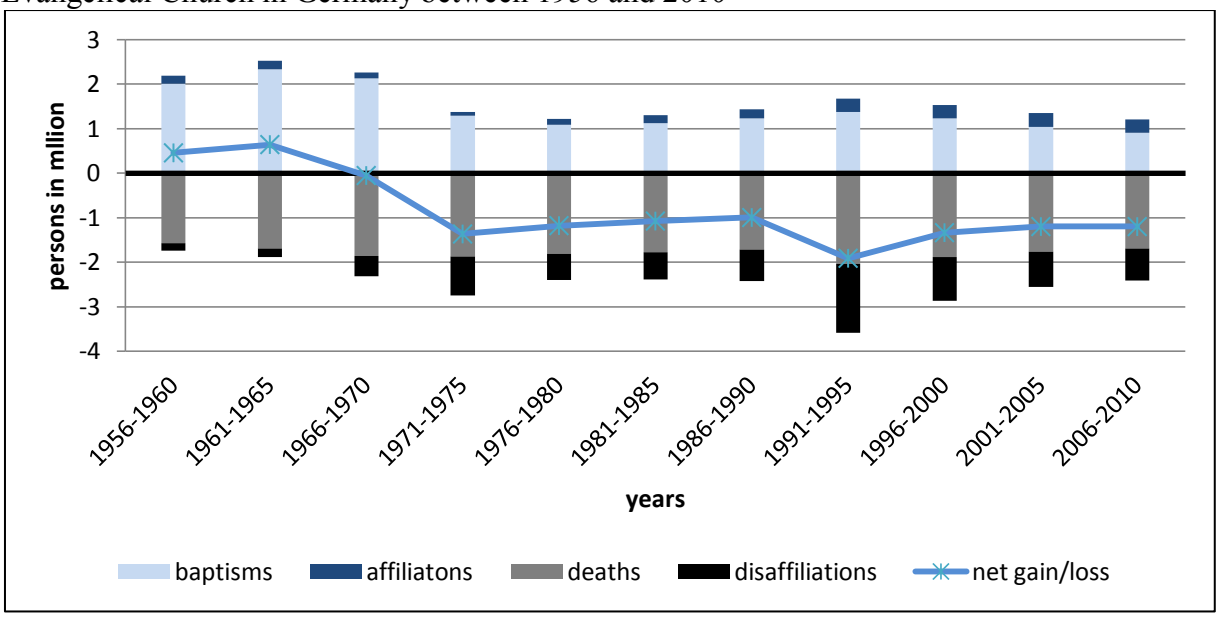
The changes described in the previous paragraph have various reasons, which can be analyzed with the tools of demographic research. At first glance, it may appear unusual to apply the principles of demography to churches. Researchers often use the term "religious change" (see, for instance, Hout, Greeley and Wilde, 2001; Crockett and Voas, 2006), which does not only sound similar to "demographic change", it also applies its techniques because "as long as the church is composed of human members, they are subject to the laws of population dynamics" (Fliegenschnee, Goujon and Lutz, 2004: 18 [my translation]). In what follows, I will describe the demographic forces that churches face. This section is structured according to the three components of religious change that Eicken (2006: 178) identifies: the natural component, the spatial component and the behavioral component. Figure 1.2 and Figure 1.3 give an overview of the quantitative importance of the natural and the behavioral components since 1956 for the Catholic and the Protestant churches.

Figure 1.2: Natural and behavioral components of demographic changes in the Catholic Church in Germany between 1956 and 2010



Data sources: Eicken and Schmitz-Veltin (2010), Statistisches Bundesamt (2011a, 2012a, 2012d).

Figure 1.3: Natural and behavioral components of the demographic changes in the Evangelical Church in Germany between 1956 and 2010



Data sources: Eicken and Schmitz-Veltin (2010), Statistisches Bundesamt (2011a, 2012a, 2012d).

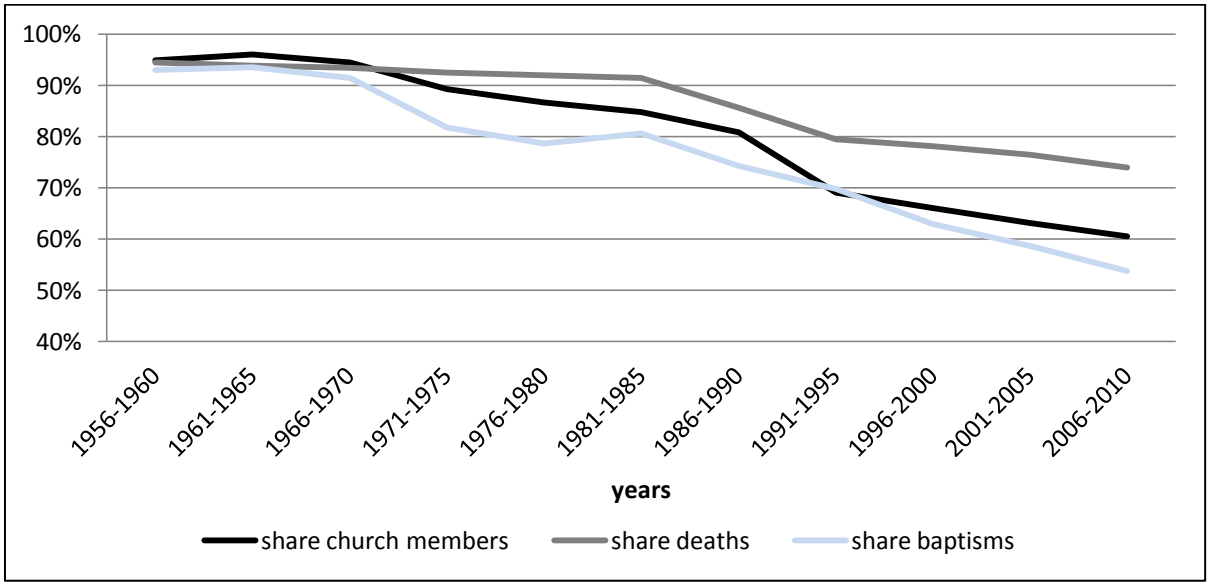
1.3.1 The natural component

The natural component refers to births and deaths of church members, i.e. the number of (infant) baptisms and the number of church members dying. The natural component is the quantitatively most important factor of membership change: the major churches in Germany

lose most of their members through death and gain most of their new members through (infant) baptism. This has been the case in every five-year period in Figure 1.2 and Figure 1.3.

The number of deaths of church members clearly depends on the age structure of the church members and their mortality rates. Eicken and Schmitz-Veltin (2012: 83-85) show, using the example of the city Stuttgart, that the share of church members is much larger among the older age cohorts than among younger cohorts. This can also be seen in Figure 1.4. Since the 1970s the share of church members among individuals who have died is higher than the share of church members in the total population, which points to the fact that church members are concentrated in the older age cohorts.

Figure 1.4: Share of church members in the German populations, share of church members among people who have died in Germany and baptisms in the Protestant and Catholic Church as a share of children born



Data sources: Eicken and Schmitz-Veltin (2010), Statistisches Bundesamt (2011a, 2012a, 2012d).
Note: All shares are average shares in the respective five-year period.

Religious fertility, i.e. (infant) baptisms, is a more complex problem than mortality. In contrast to usual demographic studies not only the number of children born is of interest, but also the decision of the parents if and in which religion they want their children to be baptized.

The low fertility in many European countries is a concern for almost all religions. Fertility is below the replacement level, which will in the medium run lead to a population decline and a decline in the membership of churches (if it is not remedied by migration). In the years

between 1961 and 1965 5.2 million children were born and 3.3 million persons died in Germany. 94 % of the latter group belonged to one of the two major churches. This means that if only 59 % of children had been baptized, the natural losses could have been replaced. As one can see in Figure 1.4, in reality around 94 % of children were baptized in that period.[10] Between 2006 and 2010 4.2 million people died in Germany, of which 74 % (3.1 million) were members of the two large Christian churches. In the same time span 3.4 million children were born. In order to replace the church members who died, 92 % of the newborns would have had to be baptized. However, the actual share of baptisms was only 54 %.

The observation that the number of baptisms as a share of children born is below the share of church members in the population can have two causes: first, the fertility of non-members is higher than that of church members and second, not all of the children that are born to Christian parents are baptized.

There is some evidence that suggests that fertility rates might be of importance. Goujon et al. (2007) note that the fertility of Muslim women in Austria is higher than of women of all other religious groups (p. 250) and if this differential in fertility persisted it would be a major source of the future growth of the Muslim share of the population (p. 261). In Germany, the share of children who are born to parents without affiliation to either of the two large Christian churches is currently higher than the share of the non-affiliated in society. In 2010, non-members made up 40.6 % of the German population, but of the children born in the same year, 43.8 % of the mothers and 49.2 % of the fathers were not members of the Evangelical Church in Germany or the Catholic Church.[11]

The second cause is the rate of baptisms. As a rough estimate, I compare the number of children born with at least one parent who is a church member with the number of baptisms. In 2010, 403,000 children were born who had at least one parent who was a church member.[12] In the same year, 344,000 baptisms took place (Statistisches Bundesamt, 2012d: 65), which corresponds to a share of 85 %. Although the willingness to have their children baptized appears to be quite high, there is also a considerable share of children who never become church members although their parents are.

[10] The share of baptisms should be seen as a rough estimate because it implicitly assumes that all children which are baptized in a period are also born in that same period.
[11] Data on the religious affiliation of parents is taken from Statistisches Bundesamt (2012a). Shares refer to those births where the religion of the parents is known. For 6 % of the mothers and 13 % of the fathers the religious affiliation is not known.
[12] This number again only refers to the cases where the religion of parents in known, therefore the real number will be even higher.

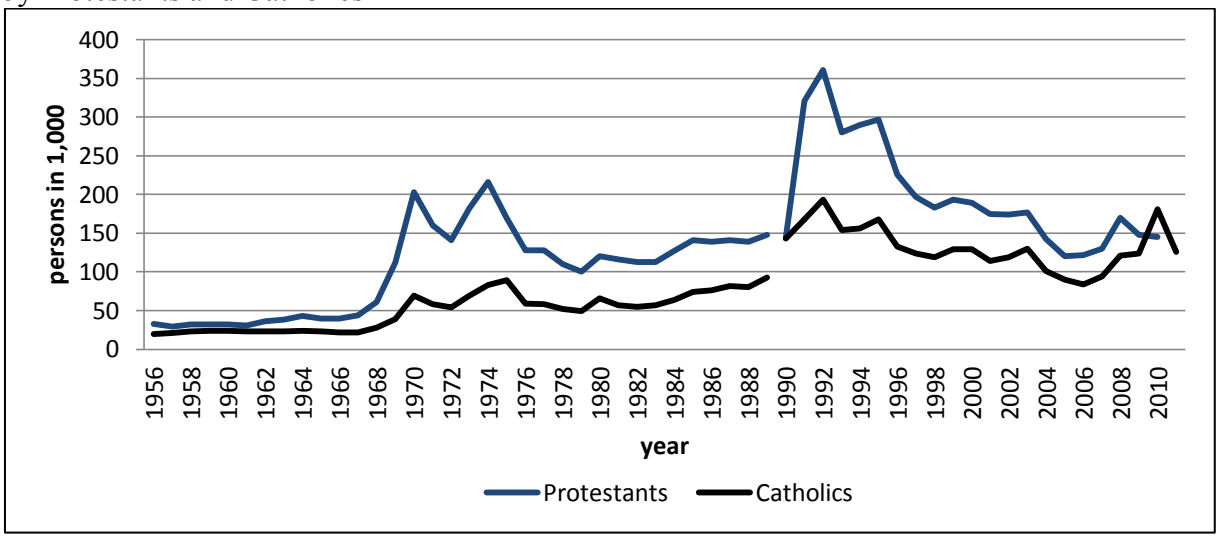
1.3.2 The spatial component

The spatial component concerns the religious composition of immigrants to and emigrants from the country or area under research. Eicken and Schmitz-Veltin (2010) argue that currently migration plays a minor role in the development of church membership numbers for the Evangelical and Catholic Churches in Germany. Between 1991 and 2008 the Protestant Church has experienced a net gain of one million members and the Catholic Church of 850,000 members through migration (Eicken and Schmitz-Veltin, 2010: 582, 586). In the same period, Germany has gained roughly 4.2 million inhabitants through spatial mobility (Statistisches Bundesamt, 2011d: 66), which indicates that the majority of immigrants do not belong to one of the two major churches. Goujon et al. (2007: 252-253) show that the number of Muslims and "others" (mainly Orthodox Christians) in Austria is increasing because their share among the immigrants is higher than their share among the emigrants. To summarize, spatial mobility has had a negligible influence on membership numbers in the Protestant and Catholic Church in Germany. Immigration can hardly mitigate the loss of members caused by natural and behavioral processes. However, the data suggest that immigration accelerates the growth in the share of persons in Germany who do not belong to one of the two large churches. In the past, the situation was different. Using the example of Stuttgart, Eicken (2006: 178) explains that in 1975 half of the foreign inhabitants of Stuttgart belonged to the Catholic Church. Those people were often labour immigrants from countries such as Spain and Italy who came to Germany in the 1960s. In contrast, the Protestant church could hardly gain members through immigration, not only in Stuttgart, but in all parts of Germany (see Eicken and Schmitz-Veltin, 2010: 589). Today, the large majority of foreigners in Stuttgart belong to neither of the two Christian churches. Eicken (2006: 178) attributes this to the high number of immigrants from Muslim countries.

1.3.3 The behavioral component

The behavioral component comprises disaffiliations and affiliations (switching, re-affiliations and baptisms of adults). In Germany, disaffiliations have been a major cause of membership decline for the Evangelical and Catholic Churches (Eicken and Schmitz-Veltin, 2010) in the past few decades, although both churches have always lost more members through death than through disaffiliation (see Figure 1.2 and Figure 1.3). The number of church disaffiliations is subject to considerable fluctuations over time. Figure 1.5 reports yearly disaffiliation numbers for Germany in the period 1956-2011.

Figure 1.5: Number of church disaffiliations in Germany between 1956 and 2011, separated by Protestants and Catholics



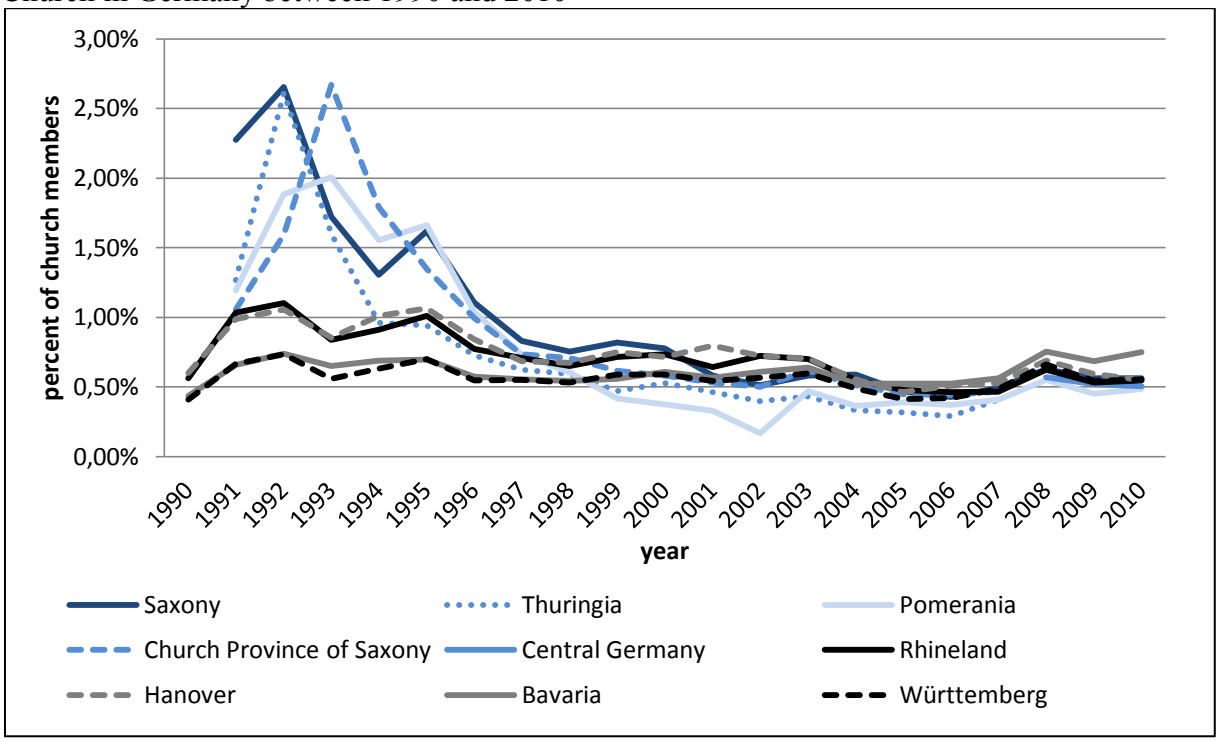
Data sources: Eicken and Schmitz-Veltin (2010), Sekretariat der Deutschen Bischofskonferenz (2012), Statistisches Bundesamt (2012d).
Note: Data for years before 1990 refer to the former FRG only.

From Figure 1.5 one can see that disaffiliation numbers in the two churches have been running parallel, with the Protestant Church at a significantly higher level. Between 1956 and 2010 4.5 million people have left the Catholic Church and 7.6 million the Evangelical Church. Researchers explain the peaks in the number of disaffiliations with social and political events as well as changes in the tax system in Germany (Pollack, 2001: 1053).[13] Disaffiliations from the church have been a negligible phenomenon in post-war Germany until 1968, when there was a first significant increase. Eicken and Schmitz-Veltin (2010: 580) attribute this first rise in disaffiliation numbers both to the political climate in Germany in 1968 and the introduction of the value added tax. The two peaks that follow in 1970/71 and 1973/4 can be attributed to the introduction of *"Konjunkturzuschlag"* and *"Stabilitätsabgabe"*, which were temporarily limited taxes levied as additional taxes to the income tax (Pollack, 2001: 1053). In the 1980s church disaffiliation numbers stabilized, although at a much higher level than before 1968. By far the largest number of church disaffiliations in Germany occurred in 1991 and 1992. First, the solidarity surcharge (another additional tax to the income tax) was introduced in 1991 and second, church taxes were re-introduced in East Germany where they had not existed during GDR times. There is a small peak again in 1995 which coincides with the re-introduction of the solidarity surcharge. In the years to follow disaffiliation numbers declined steadily. In the Protestant church they reached roughly the level which they had had before 1990, in the

[13] Changes in the tax system which have an effect on church disaffiliation appear not to be limited to changes in the church tax regulations, but rather extend to the taxation of income and consumption.

Catholic Church they were higher than before 1990. In the past few years they have risen moderately again and in 2010 for the first time the Catholic Church lost more members than the Protestant church. This can probably be attributed to the scandal about sexual abuse of children in the Catholic Church which was revealed in 2010.

Figure 1.6: Church disaffiliation rates in selected regional churches of the Evangelical Church in Germany between 1990 and 2010



Data sources: Statistisches Bundesamt (1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998), EKD (2003b, 2003c, 2003d, 2003e, 2004a, 2004b, 2005, 2006a, 2006b, 2008, 2009, 2010, 2011a, 2011b).
Note: Disaffiliation rates are calculated as the number of disaffiliations in a year in a regional church divided by the number of members of that regional church at the end of the preceding year. Blue lines indicate regional churches in East Germany, black and grey lines indicate regional churches in West Germany. Disaffiliation numbers for East German churches for 1990 are not available. In 2008 the regional church of Thuringia and the Church Province of Saxony were united and became the regional church of Central Germany. The names of regional churches usually indicate their location, although they rarely coincide with political borders. The Church Province of Saxony covers the largest part of Saxony-Anhalt as well as some northern parts of Thuringia and Saxony. The Evangelical Church of the Rhineland covers the south-west of North Rhine-Westphalia and large parts of Rhineland-Palatinate and Saarland. The regional church of Hanover covers the largest part of Lower Saxony.

Disaffiliation rates do not only differ between Protestants and Catholics, but also between regions in Germany. Figure 1.6 reports the disaffiliation rates of several regional member churches of the Evangelical Church in Germany (EKD). For illustrative purposes I chose

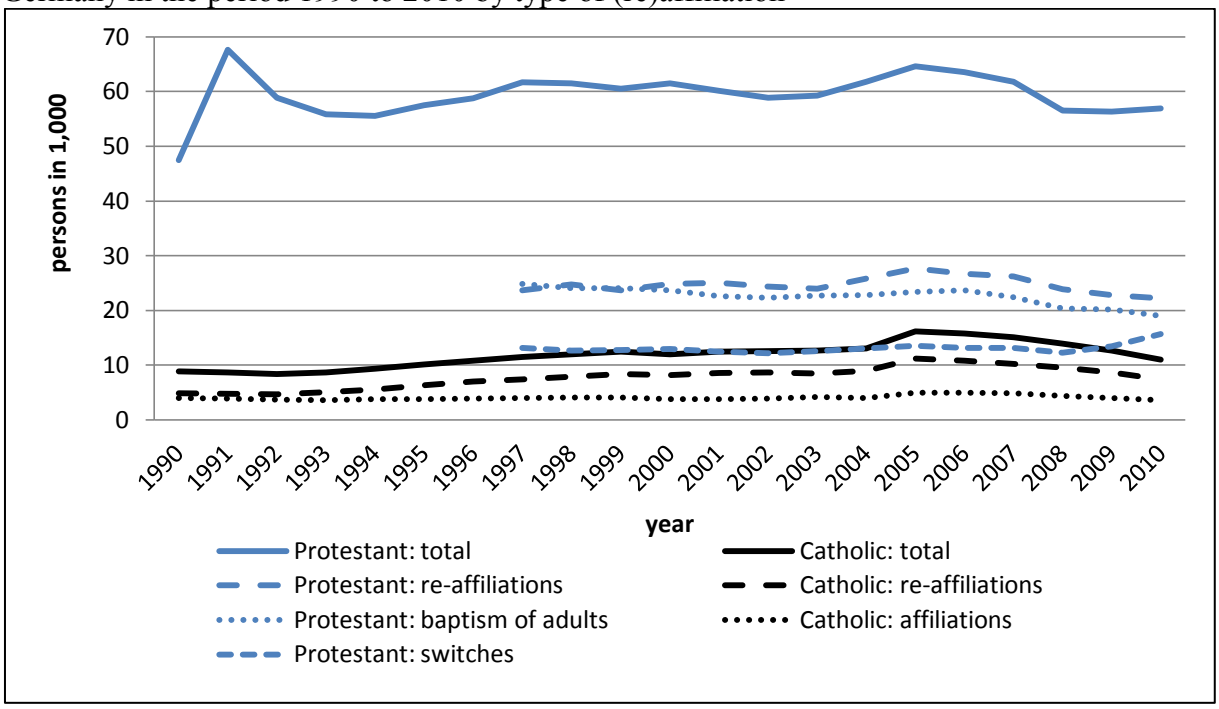
churches with a large number of members and from different regions of Germany, which do not reach beyond the formerly existing border between the Federal Republic of Germany and the German Democratic Republic. Looking at the early 1990s, one can distinguish three types of regional churches: East German churches, churches in the South of Germany and churches in the North and West of Germany. In all East German churches (blue lines) the disaffiliation rates are exceptionally high, up to 2.7 % in 1992 and 1993. At the end of the 1990s the disaffiliation rates had dropped to West German levels and have remained there since. In Thuringia and Pomerania disaffiliation rates lie below West German rates since 1999. In the West German churches disaffiliation rates at the beginning of the 1990s are also higher than in the 2000s. One can clearly see the two peaks in 1992 and 1995. Fluctuations are parallel in all four West German regional churches, but the rates are at two different levels. In the regional churches of Hanover and Rhineland (in the North and West of Germany) they are significantly higher than in Bavaria and Württemberg in the South of Germany. In recent years, differences have narrowed and Bavaria now has the highest disaffiliation rate. In the Catholic Church, similar patterns as in the Protestant Church can be observed. The difference is that disaffiliation rates are in general at a lower level. This is even true for disaffiliation rates of Catholics in East Germany at the beginning of the 1990s when disaffiliation rates were above the West German level, but not as high as in the Protestant Church. In the last 10 to 15 years they have been at the same level as the rates in West Germany.

However, apart from the pure numbers it is equally important to ask at which age people leave the church. Data for Germany and Austria shows that most disaffiliations happen between the age of 18 and 40 with a peak in the age group 25 to 30 (Eicken, 2006: 180; Goujon et al., 2007: 255; Eicken and Schmitz-Veltin, 2012: 88-89). This implies that many people leave before they have children themselves. If these people then enter marriage they will probably not pass on their (former) religion to their children. Previous research on church attendance has shown that couples where both spouses attend church are significantly more likely to have church-going offspring than couples with only one church-goer (Voas and Storm, 2012). A countervailing effect could be that there is a clear excess of men leaving the church in their younger years while women catch up with men's disaffiliation rates only after they have left their reproductive age (Eicken, 2006: 180; Goujon et al., 2007: 255). Since women are more likely to pass on their religion to their children than are their male partners (Fliegenschnee, Goujon and Lutz, 2004: 10; Crockett and Voas, 2006: 577), the problem might be somewhat mitigated. Anecdotal evidence suggests that in some families where the husband has a high

income he leaves the church to save taxes while the wife remains a church member to ensure that their children can be baptized.

Re-affiliation, religious switching and baptism of adults can also be an important driver of church membership numbers. In Germany, every year a non-negligible number of adults enter the Evangelical Church while this source of new members is irrelevant for the Catholic Church (see Figure 1.2 and Figure 1.3). Figure 1.7 shows the number of (re)affiliations for the Protestant and the Catholic Church split up in three types: baptism of adults, religious switches and re-affiliations. For the Catholic Church there is no separate data on baptism of adults and religious switches, therefore these two categories are summed up under the heading "affiliations".

Figure 1.7: Church (re)affiliation in the Protestant Church and the Catholic Church in Germany in the period 1990 to 2010 by type of (re)affiliation



Data sources: EKD (2003b, 2003c, 2003d, 2003e, 2004a, 2004b, 2005, 2006a, 2006b, 2008, 2009, 2010, 2011a, 2011b), Statistisches Bundesamt (1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011d, 2012d).
Note: For years before 1997 only combined numbers are available for the Evangelical Church. Affiliations in the Catholic Church include switches to the Catholic Church and baptism of adults.

The data in Figure 1.7 show that in the Protestant Church the number of (re)affiliations has been fluctuating around 60,000 per year with a peak in the year 2005 and a drop thereafter. In the Catholic Church, the number of (re)affiliations has been rising slowly, but steadily, since the beginning of the 1990s and has reached a peak in 2005 with more than 16,000 people joining, immediately followed by a sharp drop. The strong increase in (re)affiliations in the Catholic Church in 2005 is most likely due to the fact that in April 2005 Pope Benedict XVI (a German) was elected. Whether the peak for the Protestant Church is also connected to the election of the pope is less clear, but possible. The data also reveal that there is a very large and stable gap in the number of (re)affiliations between the Evangelical and the Catholic Church, with the Evangelical Church gaining a multiple of the number of new members of the Catholic Church.

The data in Figure 1.7 show that re-affiliation is the most important source of membership gains within the behavioral component for both large churches. However, the number of re-affiliations is much lower in the Catholic Church than in the Protestant Church; Catholic numbers are between 30 and 40 % of the Protestant numbers, although they have increased since the beginning of the 1990s. The Protestant Church additionally gains a significant number of new members through switches (mostly from the Catholic Church) and baptisms of adults, while these two types of membership gain are negligible for the Catholic Church.

The numbers of church (re)affiliations are more stable than those of church disaffiliations and appear to be rather influenced by church-related events (the election of Pope Benedict XVI in 2005; the child abuse scandal in the Catholic Church in 2010, which might have driven the number of switches to the Protestant Church in that year) than by political and economic events.

1.3.4 Summary

The natural, spatial and behavioral components of religious change have different weights in different countries and denominations. For the Evangelical and Catholic Churches in Germany both the behavioral and natural component are of exceptional importance, with the behavioral component playing a larger role for the Protestant Church because it simply has higher numbers of affiliations and disaffiliations (Eicken and Schmitz-Veltin, 2010). In the remainder of this dissertation I will concentrate on the behavioral component. It is not only quantitatively important for the development of membership numbers, it is also less mechanical and predictable than births and deaths. In addition, affiliations and disaffiliations can have a decisive importance for the natural component of membership development, e.g. if

individuals disaffiliate before they have children. For the economic situation of the two large churches in Germany, which are mainly financed by church taxes, affiliations and disaffiliations are also probably more important than deaths of church members, because the individuals who disaffiliate are usually young and pay a considerable amount of church taxes, while those who die are often pensioners who hardly pay church taxes. I will therefore try to establish what influences the behavioral component of membership change.

1.4 Outline of the dissertation

The introduction has provided evidence for both the individual and the social significance of religiosity and has underlined the prominent role of the church as an institution shaping the welfare sector, parts of the labor market and the voluntary sector in Germany. Moreover, I have briefly illustrated the secularization of Germany and the decisive role that church disaffiliations play in this regard.

Against this background, the focus of the dissertation at hand is the phenomenon of church disaffiliation – its potential economic causes and consequences. Particular attention is given to the institutional setting in which church membership decisions are taken. The institutional determinant I center on is the system of church financing and in most of this work I will concentrate on the German church tax system.

In Chapter 2 I start with a literature survey of religious consumption choices, which will serve as a basis for my own theoretical contribution. This survey will show that previous research has largely neglected the institutional framework of religious choices. Therefore in Chapter 3 I set out to develop a simple theoretical model that incorporates the church financing system as a decisive institutional factor in the church membership decision. I compare the systems of three different countries: the US, Italy and Germany. Apart from the church membership decision the model also incorporates the decision about charitable giving. This seems reasonable since church contributions are often considered as a form of charitable giving and churches are strongly involved – and are expected by both members and non-members to be involved – in the provision of welfare and charity. Therefore the model in Chapter 3 asks if and how the church financing system and the church membership decision might influence voluntary giving. The results in this chapter suggest that the church tax in Germany has an effect on the church disaffiliation decision. The higher the income of the individual and the church tax rate and the less he or she agrees with how the tax is used by the religious community, the higher is the probability of disaffiliation. In contrast, in other church financing systems such as the tax assignment system which exists in Italy, church membership decisions are independent from parameters of the tax rate and the use of funds by the church. In addition, when church contribution and charitable giving are seen as (imperfect) substitutes, the church financing system should influence charitable activity. For Germany, the model predicts that church members give less to charity than non-members, but the sum of charitable donations and church contributions exceeds the giving of non-members. Furthermore, when individuals disaffiliate from the church and the duty to pay church taxes

does not apply anymore, individuals are expected to start giving to charity if they have not given anything before, or to increase their giving.

Chapters 4 and 5 comprise empirical contributions which focus on the church tax system in Germany and are based on German income tax data. In Chapter 4 I look at the church tax as a potential cause of church disaffiliations in Germany. Based on the predictions of the theoretical model in Chapter 3 I test the hypothesis that the higher the church tax an individual has to pay – controlling for other variables, most notably income – the higher the probability that he or she disaffiliates from the church. In addition, I also discuss the influence of demographic and socio-economic characteristics of the individual as well as regional differences in the church membership decision within Germany. The results suggest that the amount of church tax an individual has to pay has a significant, but moderate positive effect on the probability to leave the church. In contrast, income seems to be irrelevant for the membership decision after controlling for the price of being a church member. In line with previous research, I find that the propensity to drop out of church varies strongly with age and depends on the region where the individual lives. While I find no gender differences in the likelihood of disaffiliation, interregional mobility appears to facilitate the decision to leave the church.

In Chapter 5 I turn my attention towards the consequences of the church tax system in Germany and of the decision to leave the church. Again, based on the model in Chapter 3, I test whether church members and non-members systematically differ in their voluntary giving (excluding church taxes). In addition, I ask if voluntary giving changes during the process of disaffiliation, i.e. from the years before to after disaffiliation. In this respect, I am also interested in the question whether those individuals who leave the church differ in their giving behavior from those who stay. This observation could help to infer something about their motivation for leaving the church. Finally, I look at two different categories of giving, one which includes religious giving and one which is purely secular, in order to see if church membership and church disaffiliation has differential effects on giving depending on which cause it benefits. The results suggest that church members are far more likely to make a donation than non-members, but when they make a contribution, the amount given is lower than that of non-members. However, the higher giving of church members is found for only one – although the quantitatively more important – category of giving. Those individuals who leave the church are significantly less generous that church members who stay, but during the process of disaffiliation I observe a moderate increase in giving.

2 A LITERATURE REVIEW OF MODELS OF INDIVIDUAL CHOICES CONCERNING RELIGIOUS CONSUMPTION AND AN INSTITUTIONAL ANALYSIS OF CHURCH FINANCING SYSTEMS

2.1 Introduction

Religion has long been considered by economists as irrational and outside the scope of decisions that can be explained by economic models. With the exception of Adam Smith in the "Wealth of Nations" and the "Theory of Moral Sentiments" (for a review see Anderson, 1988), economists have long avoided the topic. This approach has radically changed with Azzi and Ehrenberg's (1975) seminal model of religious consumption choice. Since then, the economics of religion has seen pronounced interest from economists and different sub-fields of investigation have emerged. Iannaccone (1998) gives a comprehensive overview of the development of research in the economics of religion. A similar categorization of research is presented in McCleary and Barro (2006a). The field can be separated into research on the "economic *consequences* of religion" (Iannaccone, 1998: 1466 [emphasis in original]) where religion is seen as an "independent variable" (McCleary and Barro, 2006a: 50) – a brief overview of this literature can be found in the introduction in Section 1.1 –, and the "economic analysis of religion" (Iannaccone, 1998: 1478) where religion is the "dependent variable" (McCleary and Barro, 2006a: 49). The latter strand of the literature can be further divided in a part that studies the supply side of religion by examining the religious market structure and the decision-making of religious organizations; and another part that examines demand for religion. One way of approaching the demand for religion is the development of rational choice models of individual and household decision making with respect to religion (McCleary and Barro, 2006a: 49-50). This strand of the literature is based on Azzi and Ehrenberg's (1975) seminal paper where they model a household which engages in time-consuming and money-intensive religious activities in order to derive both current benefits from religion and a pleasant afterlife.

Various researchers have subsequently taken up the ideas of Azzi and Ehrenberg (1975) and have suggested modifications to their model – simplifications, changes of central assumptions, the introduction of new features. To name only a few, researchers have modeled both individual and household decisions on religiosity, they have considered one-period and multi-period models, they have looked at external effects of individual religious activity, and

they have introduced various sources of uncertainty into the decision on religious consumption.

However, up to now the focus of research has almost exclusively been on the degree of religious consumption, which depends on monetary and time inputs into religious activity, while the decision on membership in religious organizations has been disregarded. In addition, the connection between religiosity and charitable giving has largely been neglected. Despite the large body of empirical research on this topic, very few theoretical contributions exist. Furthermore, all previous models start with the assumption that the individual is completely free to choose his or her amount of religious contributions; which is not a valid description of the situation in many European countries where churches are often financed through some kind of taxes with exogenously determined tax rates.

The aims of Chapter 2 are, first, to provide a thorough review of the existing theoretical literature on religious consumption choices, and second, to present and compare three different models of church financing: reliance on voluntary giving as in the US, church taxes following the German example, and the tax assignment system as it exists in Italy and Spain. The literature review and the comparison of institutional frameworks lay the basis for my own theoretical contribution concerning the simultaneous decision about church membership and charitable giving under three different institutional arrangements concerning religious communities. This contribution will follow in Chapter 3.

The structure of this chapter is as follows. In Section 2.2, I give an overview of the various models of religious consumption, beginning with the simplest model and introducing modifications step by step, while discussing their implications and empirical predictions. Section 2.3 reviews the few existing models of simultaneous choice concerning religious and secular charitable activities. Section 2.4 discusses the institutional framework for denominational membership as well as religious and secular voluntary contributions in three particular countries: the US, Germany and Italy. Finally, Section 2.5 draws some interim conclusions and outlines open questions and research gaps. In particular, it points out the lack of theoretical models concerning the simultaneous decision on religious and secular giving and the incorporation of different institutional arrangements into the decision on religious consumption.

2.2 Religious consumption choices

In this section I review various models of individual rational choice over religiosity. Some of the models that will subsequently be discussed have also been reviewed by Iannaccone (1998), Schmidtchen (2000) and Mangeloja (2003). The latter two papers heavily build on the much-cited literature review of Iannaccone (1998). While all of the aforementioned papers treat a variety of topics in the economics of religion, such as household decisions on religion, religious markets and economic consequences of religion, my own review focuses only on the individual or household decision on religiosity. In addition, my review centers on formal aspects of the model, whereas the previous papers only define the utility functions and budget constraints, but discuss the results verbally. I also try to incorporate all relevant theoretical models in one framework where only some of the assumptions vary. In addition, my review includes some additional aspects, in particular the joint decision on religiosity and voluntary giving; and it incorporates recent contributions such as Melkonyan and Pingle (2009) and Papyrakis and Selvaretnam (2011) that have not been reviewed in earlier papers.

The models of individual and household decision making on religiosity which are reviewed in this chapter differ in various respects. First, there are different possibilities to model the commodities in the utility function, in particular those that describe benefits from religion. Second, the inputs into the production of commodities vary; they can be only time, only money, or both. Third, inputs can be exogenously given or endogenously determined. Fourth, some models include risk or uncertainty, while others do not. This in turn influences the modeling of the decision making, which can be utility maximization under a budget constraint, maximization of expected utility or comparison of discrete utility levels. Table 2.1 provides an overview over the models that are discussed in this section. The most important features of the models and/or the novelties in comparison with previous models are highlighted in bold letters.

Table 2.1: Overview of models discussed in Chapter 2

Section	Commodities in utility function	Inputs in production of commodities	Budget constraint	Uncertainty	Decision making	Object of interest	Time
2.2.1	Secular consumption, religiosity	Time, money	Limited time, exogenous income	None	Maximization of utility under budget constraint	Individual	One period
2.2.2	Secular consumption, religiosity	Time, money	Limited time, **exogenous wage, endogenous income**	None	Maximization of utility under budget constraint	Individual	One period
2.2.3.1	Secular consumption and **afterlife consumption**	Time, money	Limited time, exogenous wage, endogenous income	None	Maximization of utility under budget constraint	Individual	**Multiple periods**
2.2.3.2	Secular consumption and **current religious consumption**	Time, money	Limited time, exogenous wage, endogenous income	None	Maximization of utility under budget constraint	Individual	Multiple periods
2.2.3.3	Secular consumption, **afterlife and current religious consumption**	Time, money	Limited time, exogenous wage, endogenous income	None	Maximization of utility under budget constraint	Individual	Multiple periods
2.2.4.1	Secular consumption, current religious consumption	Time, money	Limited time, exogenous wage, endogenous income, **tax exemption for religious spending**	None	Maximization of utility under budget constraint	Individual	Multiple periods
2.2.4.2	Secular consumption, current religious consumption	Time, money	Limited time, exogenous wage, endogenous income	None	Maximization of utility under budget constraint	**Household (husband and wife)**	Multiple periods
2.2.5	Secular consumption, afterlife and current religious consumption	Time, money, **stock of religious capital**	Limited time, exogenous wage, endogenous income	None	Maximization of utility under budget constraint	Individual	Multiple periods

2.2.6	Secular consumption, afterlife and current religious consumption	Time, money, stock of religious capital and **quality of religious group**	Limited time, exogenous wage, endogenous income	None	Maximization of utility under budget constraint	Individual	Multiple periods
2.2.7.1	Secular consumption, afterlife and current religious consumption	Time, money	Limited time, exogenous wage, endogenous income	**Timing of death**	Maximization of utility under budget constraint	Individual	Multiple periods
2.2.7.2.1	Secular consumption, afterlife and current religious consumption	Time, money	Limited time, exogenous wage, endogenous income	**Existence of afterlife**	Maximization of utility under budget constraint	Individual	Multiple periods
2.2.7.2.2	Secular consumption, afterlife and current religious consumption	Money; **discrete choice about inputs**	Exogenous income	Existence of afterlife	**Expected utility**	Individual	**Two periods**
2.2.7.2.3	Secular consumption, afterlife and current religious consumption	Money; discrete choice about input in religion	Exogenous income	**Total ambiguity about existence of afterlife**	**Multiple decision criteria**	Individual	Two periods
2.2.7.3	Secular consumption, afterlife and current religious consumption	Money	**No budget constraint,** only exogenous income	**Timing of death; existence and quality of afterlife**	**Comparison of absolute utility levels**	Individual	**Three periods**

2.2.1 The basic model

In the basic version of the religious choice model, which underlies all following models, a utility-maximizing individual derives utility from two types of goods: secular consumption C and religiosity R,

$$U = U(C, R). \tag{2.1}$$

Benefits from religiosity can be manifold. Azzi and Ehrenberg (1975: 32) distinguish three different types: "afterlife consumption", "current satisfaction" and social recognition.

"**Afterlife consumption**" (Azzi and Ehrenberg, 1975: 32) is the sum of utility a person receives in life after death and is a credence good as pointed out by Hull and Bold (1989:11) and Gill and Lundsgaarde (2004: 405).

In contrast, "**current satisfaction**" (Azzi and Ehrenberg, 1975: 32) or "temporal bliss" (Hull and Bold, 1989: 8) comprises "solace in this life" (Ekelund, Hébert and Tollison, 1992: 10), "entertainment" (Hull and Bold, 1989: 8), private religious festivities like marriages and baptisms, but also personal social capital, that means networks from which the individual receives utility, be it in the form of "fellowship" (Hull and Bold, 1989: 8), personal support, societal status[14] (see Sherkat and Wilson, 1995: 995, 999), access to the marriage market (Cameron, 1999: 441) or access to parts of the labor market. The greater the share of the regional population that attends (the same) church, the higher the utility from being a church member (Smith and Sawkins, 2003: 1581; Brañas-Garza, García-Muñoz and Neuman, 2007: 7). Participation in religious groups can therefore be seen as complementary to other activities like child-raising, leisure consumption or reputation-building (Ulbrich and Wallace, 1989: 8).

However, there is a negative side to this, too. When a large share of a person's reference group attends church, religious participation becomes a social norm that individuals need to conform to in order to gain "acceptance, recognition and affirmation from their peers" (Smith and Sawkins, 2003: 1581). Gruber (2005: 11) finds that a high market density of a religion in a region increases church attendance for the adherents of this religion. There is a "**social pressure motive**" (Azzi and Ehrenberg, 1975: 32) related to religious attendance meaning that abstaining from participation could impose cost on the individual (see also Brañas-Garza, García-Muñoz and Neuman, 2007: 9). This pressure need not only come from a person's

[14] The social capital motive is also discussed by Brewer, Jozefowicz and Stonebraker (2006: 390). They state that some individuals are more interested in connecting with important people than in the religious teachings when they attend church.

peers, it can also come from the church itself when it instills a bad conscience in a person that does not follow church rules. This mechanism functions like a tax on all kinds of non-conformist behavior (Smith, 2002: 109).

From a theoretical point of view, the main difference between these three types of benefits from religious activity is that afterlife consumption takes place in a future period (after the person's death) while the other two types of benefits accrue in the same period when they are produced. I discuss the implications of this difference below. However, in the basic one-period model this particularity is of no relevance and for the moment I leave open the nature of the benefits derived from religiosity R.

The individual disposes of an exogenous endowment of time, H, and monetary resources, y. Both religiosity and secular consumption require the input of time (h_C and h_R, respectively) and money (m_C and m_R).

$$C = C(h_C, m_C) \tag{2.2}$$

$$R = R(h_R, m_R) \tag{2.3}$$

Consequently, the individual faces the following time and budget constraints:

$$H = h_C + h_R \tag{2.4}$$

$$y = m_C + m_R \tag{2.5}$$

The Lagrangian function to be maximized is

$$L = U(C, R) + \lambda_1(H - h_C - h_R) + \lambda_2(y - m_C - m_R) \tag{2.6}$$

Solving the maximization problem and rearranging yields:

$$\frac{\frac{\partial U}{\partial R}}{\frac{\partial U}{\partial C}} = \frac{\frac{\partial C}{\partial h_C}}{\frac{\partial R}{\partial h_R}} = \frac{\frac{\partial C}{\partial m_C}}{\frac{\partial R}{\partial m_R}} \tag{2.7}$$

which is equivalent to

$$MRS = MRT(h) = MRT(m) \tag{2.8}$$

where MRS is the marginal rate of substitution between the two commodities consumption and religiosity and $MRT(.)$ is the marginal rate of transformation of the input in brackets.[15]

The results imply that both the marginal contribution of secular consumption and religiosity to the utility of the individual and the marginal productivity of the two inputs (money and time) determine the level of religiosity chosen and its mode of production. If the form of the utility function is such that religiosity creates large benefits in an (infinite) afterlife, individuals have a high marginal utility of religiosity. The same is true for individuals who live in an area where religious communities are important institutions in the everyday life, e.g. as a meeting place and organizer of leisure activities. This is more likely to be the case in rural areas (Mangeloja, 2003: 6). It might also be the case in regions where state social security systems are absent and support in the case of need is provided by religious communities (to their members).

The choice over inputs into religion depends on how religiosity can be produced (see also footnote 19). If the marginal productivity of contributing money to religion is high (a good example is selling of indulgences by the Catholic Church in the Middle Ages), individuals will mainly choose monetary inputs. In contrast, if religious persons are supposed to spend a lot of time reading the bible, attending services or praying, they will exhibit a high level of h_R. Since religions and denominations differ in their teachings about how religiosity should be produced, e.g. through intensive study of holy scriptures or through being generous, the denomination has an important effect on the marginal productivity of time and money and therefore on the combination of inputs chosen.

Furthermore, it can be expected that exogenous increases in the marginal productivity of inputs in secular consumption will lead to reductions in time and money spent for religion.[16] Gruber and Hungerman (2008) provide an impressive example. They investigate the effects of the repeal of so-called "blue laws" (i.e. laws that prohibit special activities, such as retail activities, on Sundays) on religious participation and religious contributions. When a state allows the Sunday opening of shops, individuals have greater secular opportunities to spend their time and money on Sundays – in other words, the marginal productivity of inputs into

[15] A somewhat different illustration of the model results can be found in Clain and Zech (1999: 930).
[16] For such an outcome it is necessary that the substitution effect exceeds the income effect.

secular consumption increases. As expected, Gruber and Hungerman (2008) find that religious attendance and religious giving drop significantly after the repeal of "blue laws".[17]

2.2.2 Endogeneity of income

The first extension of the model concerns the exogeneity of income. Such a modification has been suggested by Neuman (1986). Instead of assuming that the individual has an exogenously given monetary income y, I now assume that the individual has some exogenous income $\tilde{y}$ and at the same time faces an exogenously given hourly wage rate w. The income of the individual depends on the number of hours worked, l, which in turn reduce the time available for secular consumption and/or religious activities. The time and budget constraints can be written

$$H = l + h_C + h_R \tag{2.9}$$

$$\tilde{y} + w * l = m_C + m_R, \tag{2.10}$$

while the utility function of the individual is the same as in Section 2.2.1.

The Lagrangian function to be maximized is

$$L = U(C, R) + \lambda([m_C + m_R] - [\tilde{y} + w * (H - h_C - h_R)]) \tag{2.11}$$

Maximization of the problem yields

$$\left(\frac{\partial U}{\partial R}\right)\left(\frac{\partial R}{\partial h_R}\right) = \left(\frac{\partial U}{\partial C}\right)\left(\frac{\partial C}{\partial h_C}\right) = \lambda w \tag{2.12}$$

$$\left(\frac{\partial U}{\partial R}\right)\left(\frac{\partial R}{\partial m_R}\right) = \left(\frac{\partial U}{\partial C}\right)\left(\frac{\partial C}{\partial m_C}\right) = \lambda \tag{2.13}$$

Rearranging (2.12) and (2.13) yields exactly the same results as above in (2.7) and (2.8): The marginal rate of substitution between the two commodities equals the marginal rate of transformation, i.e. the ratio of the productivities of an input (time or money) in the production of the commodities.

[17] Adam Smith was probably the first to write about the substitutability of religious and secular consumption. In the "Wealth of Nations" he argues that the impact of overly strict religious sects could be limited if the government reduced restrictions in the market for entertainment. Lower prices for "jugglers, clowns, and actors" (Anderson, 1988: 1073) would – in the terms of my model – exogenously increase the marginal productivity of monetary inputs in secular consumption and thereby, according to Adam Smith, reduce the demand for strict religion (Anderson, 1988: 1073).

The budget constraint also determines the combination of inputs into a specific commodity:

$$-\frac{dm_C}{dh_C}\Big|_{\bar{C}} = -\frac{dm_R}{dh_R}\Big|_{\bar{R}} = w \tag{2.14}$$

which is equivalent to

$$MRTS(C) = MRTS(R) = w \tag{2.15}$$

For both religiosity and secular consumption, the marginal rate of technical substitution must equal the wage rate. In other words, the inputs must be chosen such that an increase by one unit of time spent with secular consumption (religiosity) reduces the monetary inputs necessary to maintain the same level of secular consumption (religiosity) by w units. An exogenous increase in the wage rate will lead to a substitution of time spent with secular consumption (religiosity) with money spent for secular consumption (religiosity), given that both types of inputs have a positive marginal productivity with respect to secular activities (religiosity) (Neuman, 1986: 1195-1196). The condition that the wage rate determines the ratio of time and money spent on religion is not only valid within individuals, but also between individuals. Persons with a comparatively high income are expected to engage in religions or denominations that do not require large time inputs but highly appreciate financial contributions by their members (Azzi and Ehrenberg, 1975: 51-52).

2.2.3 Life-cycle models

In order to derive theoretical results about the changes in religiosity over the life cycle, it proves helpful to derive a multi-period model. This was first done in the seminal paper of Azzi and Ehrenberg (1975) and has been taken up in most of the more current models.

When looking at life-cycle models, it is necessary to make explicit assumptions about the nature of religious benefits and in particular the period of their occurrence. I start with Azzi and Ehrenberg's original assumption that individuals derive only afterlife utility. After presenting some of the critical points of this assumption, I continue by discussing a model where individuals derive only current utility and I conclude with the case where both current and afterlife utility are present.

2.2.3.1 Afterlife consumption

According to Azzi and Ehrenberg (1975: 32), the utility function of the individual can be written as

$$U = U(C_1 \dots, C_t \dots, C_n, R_A), \quad t = 1, \dots, n \tag{2.16}$$

where R_A is the discounted present value of expected afterlife consumption (see Azzi and Ehrenberg, 1975: 33) and t indicates the time period. Note that secular consumption takes place in every period of the individual's earthly life while afterlife consumption only occurs in the future after the individual has died. The length of an individual's life is n periods, which is exogenously determined and known to the individual. I assume that both the production of the secular consumption good and the production of afterlife consumption require the input of both money and time.[18]

$$C_t = C(h_{Ct}, m_{Ct}) \tag{2.17}$$

$$R_A = R_A(h_{R1} \dots, h_{Rt} \dots, h_{Rn}, m_{R1} \dots, m_{Rt} \dots, m_{Rn})^{19} \tag{2.18}$$

As in the previous model, the wage rate is exogenously given and the individual endogenously determines the number of hours worked in each period, l_t. In each period the individual faces a budget constraint

$$m_{Rt} + m_{Ct} + b_t = \tilde{y}_t + w_t * (H - h_{Ct} - h_{Rt}) \tag{2.19}$$

where $\tilde{y}_t$ is an exogenously given non-labor income in period t. In order to make intertemporally optimal decisions the individual needs to transfer money between periods. Therefore I introduce the variable b_t which captures saving and dissaving. The individual does not inherit wealth, $b_0 \equiv 0$, and does not leave any bequests, $\sum_{t=1}^{n}(b_t/\delta_t) \equiv 0$, where $\delta_t = (1+i)^{t-1}$ is the discount rate and i is the interest rate. The individual receives interest on his or her stock of savings.

The resulting first order conditions for each period mirror those derived in Section 2.2.2, equations (2.12) to (2.15).

The intertemporal budget constraint is:

[18] In Azzi and Ehrenberg's (1975) original model, the production of afterlife benefits requires only the input of time. However, they discuss the model as it is presented above in their conclusions.

[19] Azzi and Ehrenberg (1975: 33) point out that the production function of afterlife consumption "need not in fact *actually* exist", but "be only *perceived* … to exist" (emphasis in original). Afterlife consumption is a credence good and there is no objective evidence that the production function is correct. In fact, adherents of different religions may assume different production functions. However, if the individual perceives no uncertainty about the form of the function, it can be used in the context of the model. If there is (subjective) uncertainty about the production function (e.g. about the existence of the afterlife or the transformation of an input into afterlife consumption) the models discussed in Section 2.2.7 may be more appropriate.

$$\sum_{t=1}^{n}\{(m_{Rt}+m_{Ct})/\delta_t\}=\sum_{t=1}^{n}\{[\tilde{y}_t+w_t*(H-h_{Ct}-h_{Rt})]/\delta_t\} \tag{2.20}$$

Saving and dissaving cancel out.

The Lagrangian function to be maximized is:[20]

$$\begin{aligned}L &= U(C_1 \dots, C_t \dots, C_n, R_A)\\ &+\lambda\left(\sum_{t=1}^{n}\{(m_{Rt}+m_{Ct})/\delta_t\}-\sum_{t=1}^{n}\{[\tilde{y}_t+w_t*(H-h_{Ct}-h_{Rt})]/\delta_t\}\right)\end{aligned} \tag{2.21}$$

The main results concerning pecuniary and time inputs into religion over time are the following (Azzi and Ehrenberg, 1975: 35-36):

$$\frac{\left(\frac{\partial R_A}{\partial h_{Rt}}\right)}{\left(\frac{\partial R_A}{\partial h_{Rt-1}}\right)}=\frac{w_t}{w_{t-1}(1+i)} \tag{2.22}$$

$$\frac{\left(\frac{\partial R_A}{\partial m_{Rt}}\right)}{\left(\frac{\partial R_A}{\partial m_{Rt-1}}\right)}=\frac{1}{1+i} \tag{2.23}$$

If the wage rate is constant over time, w_t and w_{t-1} cancel out in (2.22) and the right-hand sides of (2.22) and (2.23) are the same. If I additionally assume that the production function of afterlife consumption is the same in periods $t-1$ and t, $R_A(h_{Rt}, m_{Rt}) = R_A(h_{Rt-1}, m_{Rt-1})$, then both religious giving and time spent with religion should increase over time. The slope of the increase is determined by the interest rate i. In early stages of his or her life, the individual spends a lot of time working and saving money for which he ir she receives interest. In later stages of life, the individual spends more money and time on religion. The reason for this result is that in the model the individual can accumulate interest on his or her savings, but not on his or her inputs into religion. I can also relax the assumption that the production function of afterlife utility is constant over time. For example, the theory of "religious human capital" (see Section 2.2.5) states that proficiency in religion grows over time. An hour spent with

[20] In the present model – as in most models of religious consumption choice – monetary variables are discounted using the interest rate. Blomberg, DeLeire and Hess (2006) present a model where the individual does also have a time preference, i.e. the utility of future periods is discounted.

religious activities is more productive the more experience one has. If this is the case, the age profile of time spent for religion becomes even steeper.

If, however, the wage rate increases over time the increase in religious participation from one period to the next will be less steep. Even decreases in time spent with religion are possible if the wage increase is large enough. As a result a U-shaped profile of religious participation is possible. During childhood, opportunity costs of religious participation are low and participation is high. During working life, wage rates increase and the individual tends to replace religious participation by pecuniary contributions. In the prime working years, participation is lowest, but increases thereafter as opportunity costs of time decrease again and proficiency in religion, i.e. productivity, is highest. Neuman (1986) finds a U-shaped age profile of religious time inputs for male Jewish workers.

Some authors criticize the modeling of the afterlife in Azzi and Ehrenberg (1975). Ulbrich and Wallace (1983) and Pyne (2010) claim that Azzi and Ehrenberg's assumptions about the afterlife do not match the belief systems of most religions. Both the "continuous distribution" Pyne (2010: 47) of afterlife consumption and the idea that afterlife consumption is "monotonically increasing" Ulbrich and Wallace (1983: 44) in inputs of religious activities are questionable. Furthermore, the present model is not able to explain the religiousness of people who do not believe in the existence of an afterlife.

2.2.3.2 Current religious consumption

In contrast to the model above, I now assume that the benefits from religiosity accrue in the form of temporal bliss or social pressure and completely disregard the afterlife. Such a model was first proposed by Sullivan (1985) and was later taken up by Sawkins, Seaman and Williams (1997).

The utility function of the individual includes utility from both secular consumption and religiosity in all n periods of life.

$$U = U(C_1 \dots, C_t \dots, C_n, R_1 \dots, R_t \dots, R_n), \quad t = 1, \dots, n \tag{2.24}$$

Note that the main difference between this model and the model in the previous section is that religious consumption accrues in each period of the individual's life, therefore I write R_t instead of R_A.

In each period, the two commodities are produced by inputs of money and time:

$$C_t = C_t(h_{Ct}, m_{Ct}) \tag{2.25}$$

$$R_t = R_t(h_{Rt}, m_{Rt}) \tag{2.26}$$

The intertemporal budget constraint is the same as above, see equation (2.20).

The Lagrangian function to be maximized is:

$$\begin{aligned} L &= U(C_1 \dots C_n, R_1 \dots R_n) \\ &+\lambda\left(\sum_{t=1}^{n}\{(m_{Rt} + m_{Ct})/\delta_t\} - \sum_{t=1}^{n}\{[\tilde{y}_t + w_t * (H - h_{Ct} - h_{Rt})]/\delta_t\}\right) \end{aligned} \tag{2.27}$$

The main results concerning pecuniary and time inputs into religiosity over time are the following (see Sullivan, 1985: 311):

$$\frac{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial h_{Rt}}\right)}{\left(\frac{\partial U}{\partial R_{t-1}}\right)\left(\frac{\partial R_{t-1}}{\partial h_{Rt-1}}\right)} = \frac{w_t}{w_{t-1}(1+i)} \tag{2.28}$$

$$\frac{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial m_{Rt}}\right)}{\left(\frac{\partial U}{\partial R_{t-1}}\right)\left(\frac{\partial R_{t-1}}{\partial m_{Rt-1}}\right)} = \frac{1}{1+i} \tag{2.29}$$

In contrast to the previous model (equations (2.22) and (2.23)) the marginal utilities might now be different in each period and do not cancel out. In some periods of an individual's life, benefits from a certain level of religiosity might be higher, e.g. when one is dependent on help from fellow believers, or when one consumes goods which can be complementary to religiosity, such as children or leisure. If such a situation occurs, one would expect an increase in the resources spent for religious activities. In the present model the age and income effects on religiosity are less straightforward than in the previous model because they additionally depend on the distribution of the marginal utility of religiosity (and implicitly on the consumption of goods which are substitutes or complements to religiosity) over time.

The model in this section is helpful to avoid some of the problems that occur when religiosity only produces afterlife utility. In particular, the researcher need not make assumptions about the afterlife and how afterlife consumption is related to this-worldly activities, which is usually not the core competence of an economist. However, one could argue that religious

activities thereby lose their specific features and the model could easily be applied to all human activities that require the input of time and money. The most comprehensive and realistic approach is certainly to account for both this-worldly and afterlife benefits.

2.2.3.3 Afterlife and current religious consumption

The two approaches of modeling only afterlife consumption or only current religious consumption can easily be combined in one model (see Azzi and Ehrenberg, 1975: 37). The model and a detailed discussion of results can be found in Appendix A.1. The results are a combination of the results of the previous two models: while afterlife considerations imply increasing or U-shaped religious participation over the life-cycle, high current benefits from religion might induce the individual to deviate from such a time path.

2.2.4 Extensions of the framework

Various extensions of the model of religious consumption choices have been discussed. In this section I present the implications of a tax exemption for monetary contributions to religion and of joint household production of religiosity. In order to keep the model simple, I assume that only current utility from religion is produced. The extensions to the cases when only afterlife benefits or both afterlife benefits and current utility are produced are straightforward.

2.2.4.1 Tax exemptions for monetary contributions to religion

Sullivan (1985) introduces a tax exemption for religious giving, which makes financial contributions to religion less expensive in comparison to spending on secular consumption goods. The corresponding intertemporal budget constraint is

$$\sum_{t=1}^{n}\{[(1-\mu_t)m_{Rt}+m_{Ct}]/\delta_t\}=\sum_{t=1}^{n}\{[\tilde{y}_t+w_t*(H-h_{Ct}-h_{Rt})]/\delta_t\} \qquad (2.30)$$

where μ_t is the marginal tax rate of the individual. The marginal tax rate is chosen because voluntary charitable contributions, such as contributions to religious organizations, are tax-deductible in most countries. In other words, they reduce the taxable income and thereby the income tax. The higher the marginal tax rate on the last unit of income is, the higher is the reduction in income taxes. Therefore the term $(1-\mu_t)$ can be called the "price of giving".

The resulting first-order condition for pecuniary religious contributions over the life cycle is:

$$\frac{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial m_{Rt}}\right)}{\left(\frac{\partial U}{\partial R_{t-1}}\right)\left(\frac{\partial R_{t-1}}{\partial m_{Rt-1}}\right)} = \frac{(1-\mu_t)}{(1-\mu_{t-1})(1+i)} \tag{2.31}$$

Compared to the result of the model without taxes (equation (2.29)) the marginal tax rate of periods t and $t-1$ appears on the right-hand side of the equation. Provided that the marginal productivity of religious inputs and the marginal utility of religious consumption are constant over time, the individual shifts his or her religious contributions to those periods when the marginal tax rate is highest (i.e., the price of giving is lowest). If the price of giving was fixed over time, as in the model of Chang (2005: 5-7), it would only affect the amount of giving, but not the time path, since the terms $(1-\mu_t)$ and $(1-\mu_{t-1})$ would cancel out.[21]

Adding the tax exemption also yields additional insights concerning the within-period substitution of monetary and time inputs in religious production. For each period t, one can write

$$-\frac{dm_{Rt}}{dh_{Rt}}\Big|_{\overline{R_t}} = \frac{w_t}{(1-\mu_t)} \tag{2.32}$$

The left hand side of equation (2.32) is the marginal rate of technical substitution between monetary and time inputs into religion, keeping current religious consumption constant. When one compares this result with equation (2.14) the marginal tax rate now appears on the right-hand side of the equation. If the tax exemption reduces the price of monetary religious contributions, individuals will substitute time spent with religious activities with religious giving.

2.2.4.2 Joint household production

Another extension, which is thoroughly discussed in the original paper by Azzi and Ehrenberg (1975), is the joint household production of religiosity. The formal presentation of the model can be found in Appendix A.2. It is assumed that husband and wife jointly produce current current religious consumption and secular consumption for the household. The central result is that the marginal rate of technical substitution between the time inputs of husband and wife

[21] Apart from changes in the tax system, the most obvious reason for changes in the marginal tax rate is the existence of a non-linear (usually progressive) income tax. Formally showing all implications of a progressive tax system when wages change over time is beyond the scope of this model. However, assuming that wages increase with rising age, marginal tax rates rise as well and religious giving becomes less expensive over time. This should result in increasing religious contributions as individuals get older (Sullivan, 1985: 311-312). At the same time individuals have a further incentive to substitute religious participation with religious giving when their wage is highest.

into religiosity are determined by the ratio of the two wage rates. Since men and women often face different opportunity cost of time in the form of different market wages, the model predicts that the partner with the lower wage – often the wife – spends more time producing the religious commodity while the husband engages in market activities. According to Azzi and Ehrenberg, this reasoning provides an explanation for the higher religious participation of women that is often found in empirical studies. (Azzi and Ehrenberg, 1975: 34-35)[22]

2.2.5 Religious human capital

In Section 2.2.3.1 I already pointed out that the productivity of time spent with religious activities may increase over time because of learning effects. Iannaccone (1990, 1998: 1481-1482) describes and formalizes this idea, which has become well-known in the literature on economics of religion under the term "religious human capital". The main idea is that the production of religious commodities – both current and afterlife religious consumption – do not only depend on pecuniary and time inputs in the current period (as in the models in Sections 2.2.1 to 2.2.4), but also on the stock of religious capital that has been accumulated in earlier stages of the individual's life, s_{Rt}.

$$C_t = C_t(h_{Ct}, m_{Ct}) \tag{2.33}$$

$$R_t = R_t(h_{Rt}, m_{Rt}, s_{Rt}) \tag{2.34}$$

$$R_A = R_A(h_{R1} \dots, h_{Rt} \dots, h_{Rn}, m_{R1} \dots, m_{Rt} \dots, m_{Rn}, s_{R1} \dots, s_{Rt} \dots, s_{Rn}) \tag{2.35}$$

Religious human capital is in turn a function of previous inputs into the production of religiosity,

$$s_{Rt} = F(h_{Rt-1}, m_{Rt-1}, s_{Rt-1}) \tag{2.36}$$

One can think of religious human capital as experiences and knowledge about a specific religion and the integration in a religious community. It is an additional input in the production of religious commodities and increases the marginal productivity of money and time spent in the production of the religious commodity. As an example, a person who has been a member of a certain religious organization for a long time knows which charities are most compatible with the religious teachings of the group and will spent his or her money on

[22] In the original model by Azzi and Ehrenberg (1975) the spouses also jointly produce afterlife utility. The assumption that the inputs of husband and wife in the production of an afterlife for the couple are substitutes has subsequently been questioned (see Ulbrich and Wallace, 1983: 44; Pyne, 2010: 47). Most theoretical models therefore restrict themselves to look at one single individual.

such charitable projects. Similarly, if someone is accustomed with the teachings of a religious group, it will be easier to follow a worship service.

An aspect that is not covered by the formal model of Iannaccone (1998: 1481-1482), but that he implicitly mentions when he writes that religious human capital helps to "produce and appreciate religious commodities" (Iannaccone, 1990: 299), is that religious human capital also increases the marginal utility from religiosity. If someone is accustomed to the teachings and the typical behavior of a religious group, he or she will find it easier to derive utility from his or her religious efforts, e.g. support from co-religionists, social contacts or pleasure from participating in church-related leisure activities. Both effects of religious human capital suggest that religious inputs should increase over the life-cycle.

Since religious human capital is religion- or denomination-specific, the model also suggests that most people will stay in the denomination they grew up with or switch early in life. As far as spouses jointly accumulate religious human capital, one should expect most marriages to be homogamous. (Iannaccone, 1998: 1481-1482).

2.2.6 Religious clubs

The theory of religious clubs incorporates the existence of religious communities into the model (Iannaccone, 1998: 1482). So far in this chapter, individuals (or households) have made decisions that were completely independent from the religious choices of other individuals. Iannaccone (1992, 1998) suggests making the religious production function of the individual dependent on fellow worshippers' religious inputs. The previous model is extended by including the group quality, q_t, into the production function of current religious consumption goods.[23] It is also helpful to introduce a superscript indicating the individual.

$$C_t^i = C_t^i(h_{Ct}^i, m_{Ct}^i) \tag{2.37}$$

$$R_t^i = R_t^i(h_{Rt}^i, m_{Rt}^i, q_t^i) \tag{2.38}$$

$$R_A^i = R_A^i(h_{R1}^i, \dots h_{Rt}^i, \dots h_{Rn}^i, m_{R1}^i, \dots m_{Rt}^i, \dots m_{Rn}^i) \tag{2.39}$$

[23] Iannaccone (1992, 1998) does not differentiate between current and afterlife religious consumption, therefore it is not quite clear whether he assumes that group quality also has an influence on afterlife utility. However, from the discussion in his papers and the examples he gives it appears as if he concentrates on current benefits. In addition, it seems to be more in line with the common understanding of most faiths that the religious inputs of the individual matter for the afterlife, not so much the environment he or she lives in. This thinking is also in line with the criticism of Azzi and Ehrenberg's (1975) household production model, where critics argue that one spouse cannot produce afterlife consumption for the other.

The quality q_t is a strictly increasing function of the average religiosity of all other individuals, R_t^{-i},

$$q_t^i = q_t^i\left(R_t^{-i}\right) \tag{2.40}$$

which can be calculated as

$$R_t^{-i} = \sum_{j \neq i} \frac{R_t^j}{N-1}. \tag{2.41}$$

with N being the size of the religious community of individual i (Iannaccone, 1992: 277). Group quality can be interpreted in various ways. It comprises the devotion of co-religionists during prayer and worship and their engagement in religious volunteering and charitable religious activities. Berman (2000: 922) stresses that in the case of Ultra-Orthodox Jews the quality of the religious group is the welfare that is provided to all members who are in need. With group quality entering the religious production function, producing the religious commodity does not only increase one's own utility, but also has a positive externality on fellow believers by increasing their level of religiosity. However, if the religious community is sufficiently large, individuals will take others' religious contributions as given and disregard their own influence on the religious consumption of the other members. Consequently, participation levels are too low. (Iannaccone, 1992: 278)

Iannaccone (1992, 1994) and Berman (2000) discuss two ways to overcome the free-rider problem: production of religious commodities can be subsidized or production of secular commodities can be made more expensive. Often the second path is chosen: strict religious organizations prohibit a certain diet, alcohol, gambling, some kinds of sexual behavior, etc. (see also Hollander, Kahana and Lecker, 2003: 494). This way, they can screen out the most committed members and the average quality of the group is increased.

To sum up, the club model of religion provides an explanation why some people get involved in religious groups that require high sacrifices in terms of time or money. In this way the groups seek the most committed members and increase group quality. However, this only works if the group offers some highly valuable benefits, such as social security, exclusively to its members.

2.2.7 Uncertainty

In the models I have presented so far, individuals had full information about all features of the model. However, in reality there are various sources of uncertainty. In what follows, I discuss

some aspects, in particular uncertainty about the existence of the afterlife, about the one "right" religion and about the length of the individual's own life. For simplicity, I abstract from both "religious human capital" and religious club models and go back to the model I discussed in Section 2.2.3.

2.2.7.1 Uncertainty about the timing of death

Blomberg, DeLeire and Hess (2006) present a model that explicitly takes into account the influence of the probability of death in each period. The basic idea of the model is that the higher the probability of death in the next period, the higher should be the weight of afterlife utility in the utility function of the individual.

I re-write the model of Blomberg, DeLeire and Hess (2006) in order to fit it into the previous framework. The lifetime utility function now includes the probability of death in each period, while the budget constraint is virtually unchanged, except for the fact that the number of periods is no longer fixed at n, but infinite. The Langrangian function to be maximized is

$$\begin{aligned} L = &\sum_{t=1}^{\infty}\{\pi_t * U^I(C_t, R_t) + \pi_t * P_{t+1}(D) * U^{II}(R_A)\} \\ &+\lambda\left(\sum_{t=1}^{\infty}\{(m_{Rt} + m_{Ct})/\delta_t\} - \sum_{t=1}^{\infty}\{[\tilde{y}_t + w_t * (H - h_{Ct} - h_{Rt})]/\delta_t\}\right), \end{aligned} \tag{2.42}$$

where $P_t(D)$ is the probability of death at the beginning of period t and π_t is the probability of having survived until the beginning of period t,

$$\pi_t = \prod_{z=1}^{t}(1 - P_z(D)) \tag{2.43}$$

I first derive the first-order conditions for a specific period t. When looking at one period in which the individual is still alive, the probability of having survived so far, π_t, is irrelevant for the current decision while the probability of death in the next period is crucial:

$$P_{t+1}(D) * MU(R_A) * MP(h_{Rt}) + MU(R_t) * MP(h_{Rt}) = MU(C_t) * MP(h_{Ct}) \tag{2.44}$$

$$P_{t+1}(D) * MU(R_A) * MP(m_{Rt}) + MU(R_t) * MP(m_{Rt}) = MU(C_t) * MP(m_{Ct}) \tag{2.45}$$

The higher the probability of death in the next period, the more religious activities the individual will undertake in comparison to secular consumption (Blomberg, DeLeire and

Hess, 2006: 8). This would suggest that older people as well as severely ill people should be more religious than young and healthy people.

When comparing decisions in different periods, the following first-order conditions occur:

$$\big(1-P_t(D)\big)\frac{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial h_{Rt}}\right)+P_{t+1}(D)*\left(\frac{\partial U}{\partial R_A}\right)\left(\frac{\partial R_A}{\partial h_{Rt}}\right)}{\left(\frac{\partial U}{\partial R_{t-1}}\right)\left(\frac{\partial R_t}{\partial h_{Rt-1}}\right)+P_t(D)*\left(\frac{\partial U}{\partial R_A}\right)\left(\frac{\partial R_A}{\partial h_{Rt-1}}\right)}=\frac{w_t}{w_{t-1}(1+i)} \tag{2.46}$$

$$\big(1-P_t(D)\big)\frac{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial m_{Rt}}\right)+P_{t+1}(D)*\left(\frac{\partial U}{\partial R_A}\right)\left(\frac{\partial R_A}{\partial m_{Rt}}\right)}{\left(\frac{\partial U}{\partial R_{t-1}}\right)\left(\frac{\partial R_t}{\partial m_{Rt-1}}\right)+P_t(D)*\left(\frac{\partial U}{\partial R_A}\right)\left(\frac{\partial R_A}{\partial m_{Rt-1}}\right)}=\frac{1}{1+i} \tag{2.47}$$

If $P_{t+1}(D)$ is large compared to $P_t(D)$, m_{Rt} and h_{Rt} have to be large in comparison to m_{Rt-1} and h_{Rt-1}. That means that individuals tend to shift religious activities to periods when the probability of death is high.

Demographic changes which are characterized by a longer average life expectancy and a lower probability of death in the early periods of life therefore have the effect that young people are not forced to think about the afterlife when they are still young and postpone the production of religious (afterlife) commodities. However, the model also shows that high current utility from religion can still induce individuals to keep up a high level of religiosity, even when they are young.

2.2.7.2 Uncertainty about the existence of an afterlife

2.2.7.2.1 A simple approach

A simple way to incorporate insecurity about the existence of an afterlife into the model is to postulate a utility function with two additively separable parts: (secular and religious) current utility and afterlife utility, where afterlife utility is dependent on the (subjective) probability that an afterlife exists, $P(A)$[24]:

$$U_t = U^I(C_t, R_t) + P(A) * U^{II}(R_A), \quad t = 1, \dots, n^{25} \tag{2.48}$$

[24] In most of the previous models it was implicitly assumed that the probability of the existence of an afterlife is one.

[25] The model can easily be extended to incorporate the possibility of choosing the "wrong" religion:

$$U_t = U^I(C_t, R_t) + P(A) * P(B) * U^{II}(R_A), \quad t = 1, \dots, n$$

where $P(B)$ is the (subjective) probability of having the "correct" religion (see Pyne, 2010: 51).

This model is briefly discussed in Azzi and Ehrenberg (1975: 52). More recent applications include Tao and Yeh (2007) and Pyne (2010). The optimality conditions now incorporate the probability of existence of an afterlife:

$$P(A) * MU(R_A) * MP(h_{Rt}) + MU(R_t) * MP(h_{Rt}) = MU(C_t) * MP(h_{Ct}) \quad (2.49)$$

$$P(A) * MU(R_A) * MP(m_{Rt}) + MU(R_t) * MP(m_{Rt}) = MU(C_t) * MP(m_{Ct}) \quad (2.50)$$

(see Tao and Yeh, 2007: 774). The model predicts that the higher the subjective probability that the afterlife exists, the higher *ceteris paribus* the inputs of time and money into the production of the religious commodities.

The intertemporal decision about the resources devoted to religion is unaltered by the introduction of $P(A)$ because the probability is modeled to be time-invariant. However, if there is an increase in the subjective probability of the existence of life after death, one expects that time and money spent for religion will grow as well.

The model can be put in an insurance framework where individuals insure themselves against the existence of an afterlife. A detailed discussion can be found in Appendix A.3.

2.2.7.2.2 Religion as a discrete choice

Instead of determining the level of religious inputs one can also go one step back and ask what the determinants of the decision to be religious are. In other words, I model a discrete decision. This type of model is outlined in Montgomery (1996: 443) and Melkonyan and Pingle (2009). The individual faces two states of the world – the afterlife exists, or it does not – and he or she has only two choice options – being religious or not. For simplicity I assume that there are only two time periods (this life and the afterlife) and that the income of the individual is exogenously determined. Furthermore I make the assumption that only monetary inputs in the production of religiosity exist. These monetary inputs m_R are set to a fixed level $k > 0$ in the case the individual decides to be religious, while the second choice option is being an atheist with $m_R = 0$. It is assumed that $R_A(k) > R_A(0)$, i.e. the person has a more pleasant afterlife when he or she is religious. The respective payoff matrix can be seen in Table 2.2. Payoffs *I* are the sum of secular consumption and current and afterlife religious consumption. Superscripts indicate the choice of the individual (afterlife insurance or no afterlife insurance), subscripts indicate the state of the world. The first derivatives of all commodities with respect to their respective inputs are assumed to be positive.

When the individual chooses no inputs into religion, his or her secular consumption opportunities are larger, but he or she does not have any current utility from religion and – in case the afterlife exists – also has a much less pleasant afterlife.

Table 2.2: Payoff matrix in different states of the world and with different choices concerning afterlife insurance

	State 1: Afterlife exists with probability $P(A)$	State 2: Afterlife does not exist with probability $1 - P(A)$
Afterlife insurance $m_R = k$	$I_1^a = C(y-k) + R_t(k) + R_A(k)$	$I_2^a = C(y-k) + R_t(k)$
No afterlife insurance $m_R = 0$	$I_1^n = C(y) + R_A(0)$	$I_2^n = C(y)$

The individual compares the expected utilities of both alternatives

$$EU(k) = P(A) * U[C(y-k) + R_t(k) + R_A(k)] + \big(1 - P(A)\big) * U[C(y-k) + R_t(k)] \tag{2.51}$$

and

$$EU(0) = P(A) * U[C(y) + R_A(0)] + \big(1 - P(A)\big) * U[C(y)] \tag{2.52}$$

The individual has to weigh the loss in secular consumption caused by religious contributions against the current benefits from religious activities and the possible afterlife benefits. Which alternative will be chosen is a priori unclear and depends on k as well as on the form of the utility function and the production function of each commodity. The individual will choose to be religious if the probability of afterlife existence, this-worldly or other-worldly religious benefits are high; or if the secular costs of religion are low (e.g. because there are limited opportunities for secular consumption). It should also be noted that the specific theology is important: people who grow up in religions or denominations that promise a particularly blissful afterlife for the faithful and serious punishment for non-believers, i.e. $R_A(k) - R_A(0)$ is large, will be more likely to choose to be religious.

The framework can easily be extended to capture more than one religion (see Melkonyan and Pingle, 2009: 11-16). The general reasoning remains the same, however, now the so-called

"differential penalties" (Melkonyan and Pingle, 2009: 12) enter the decision. By this term the authors mean the differences in afterlife costs of two religions if a third religion was the "true" one. For example, if it turned out that Catholicism was the true religion, some people could argue that the penalty in the afterlife for choosing the wrong religion would be smaller for Protestants than for Muslims.

2.2.7.2.3 Religious choice under total ambiguity

Some researchers express criticism of the assumptions underlying the previous models of religious choice under uncertainty. Montgomery (1996: 444) argues that the subjective probabilities of the existence of an afterlife or the truth of a specific religion might depend on the religious choices of the individual and could therefore change during life. Montgomery (1992, 1996) and Melkonyan and Pingle (2009) question whether individuals can actually form these subjective probabilities. Melkonyan and Pingle (2009: 6-7) stress that even if the probability distribution is completely unknown (i.e. there is total ambiguity), the individual must still make a decision about religion. As decision criteria, Melkonyan und Pingle (2009: 8) suggest the following: max-max criterion, max-min criterion, Hurwicz criterion, min-max regret criterion and principle of insufficient reason. The expected utility approach which was discussed above is not available because it requires that (subjective) probabilities of the different states of the world can be formed.

Appendix A.4 shows which decisions about religiosity each of the criteria imply. In general, optimists can be expected to choose religion when afterlife utility is high, while pessimists choose religion if the punishment for not being religious is high (Melkonyan and Pingle, 2009: 16). A critical point of this model is that one has to assume that the benefits of religion (in particular the afterlife benefits) are finite, measurable and known to the individual. If they were infinite, being religious would be the only rational choice.

2.2.7.3 A multi-period model of discrete religious choice under uncertainty

One of the most recent models of religious choice is by Papyrakis and Selvaretnam (2011). It combines various features of the different modeling approaches discussed in this section so far. The authors use a multi-period model, however, the number of periods is restricted to three of which the last period is the afterlife. Furthermore, they introduce various forms of insecurity: insecurity about the probability of death in the second period, insecurity about the existence of an afterlife and insecurity about the probability of receiving afterlife benefits, given religious activities during one's earthly life. The religious choice is discrete: in each of the first two periods the individual can decide whether he or she is religious or not.

The decision problem of the individual is solved by backwards induction, first looking at the decisions when old and then modeling the religious choice of the young cohort, given what they will do when they are old.

As in all previous models, being religious comes at the cost of reductions in secular consumption, but at the same time creates current religious benefits and increases afterlife utility.[26] The marginal productivity of the inputs and the marginal utility of all commodities are strictly positive.

An individual in the second period of his or her life faces the following decision: given he or she was religious in the first stage of life, the individual will leave the religious community if

$$[(1-\xi)*C(y_2)+R_2]+\frac{P(A)*P(R;R)}{\delta_2}*R_A < C(y_2)+\frac{P(A)*P(R;N)}{\delta_2}*R_A \quad (2.53)$$

where ξ is a share of secular consumption that is lost if the person decides to be religious, y_2 is the exogenous income in the second period of life, which is smaller than income in the first period, y_1. R_2 is the current benefit from religiosity in period 2 and $P(.;.) \in (0;1)$ is the probability of going to heaven, which is dependent on the religiosity in both periods of this-worldly life. We have

$$P(R;R) > P(N;R) > P(N;N) > P(R;N) \quad (2.54)$$

where R signifies being religious and N non-religious. The first argument refers to the first period of life, the second argument to the second period. If the individual dies at the end of period 1, the probability of heaving a pleasant afterlife is $P(R;R)$ if he or she was religious as a young person and $P(N;N)$ if not.

If the individual was not religious in period 1, he or she would stay a non-member if

$$[(1-\xi)*C(y_2)+R_2]+\frac{P(A)*P(N;R)}{\delta_2}*R_A < C(y_2)+\frac{P(A)*P(N;N)}{\delta_2}*R_A \quad (2.55)$$

From both inequalities it is possible to derive a critical level of secular consumption, $C(y_2)$, above which the individual will choose to not be religious. Rearranging (2.53) yields

[26] The functional form of the utility function is the same as in (A.16).

$$C(y_2) > \frac{R_2 + \frac{P(A)}{\delta_2} * \ [P(R;R) - P(R;N)] * R_A}{\xi} \tag{2.56}$$

The critical level derived from (2.55) is

$$C(y_2) > \frac{R_2 + \frac{P(A)}{\delta_2} * \ [P(N;R) - P(N;N)] * R_A}{\xi} \tag{2.57}$$

The difference between (2.56) and (2.57) is the probability of going to heaven. Since

$$[P(R;R) - P(R;N)] > [P(N;R) - P(N;N)], \tag{2.58}$$

the income threshold for leaving the church when one was religious as a young person is higher than the threshold for remaining unreligious when one was not religious in the early years of life. However, the model clearly shows that it is individuals with a high second period income who tend to be not religious in the second period.

Now that the decision in the second period is clear, one can determine religiosity in the first period. Here Papyrakis and Selvaretnam (2011: 441) make the assumption that the income in the second period is lower than in the first, resulting in a lower maximum secular consumption, $C(y_2) < C(y_1)$, and that the current benefits of religious participation are the same in both periods, $R_2 = R_1$.

If second-period income is sufficiently low, i.e. below the level determined in inequality (2.57), the individual will always be a church member in the second period. He or she therefore compares the utility of being religious in both periods with the benefits of postponing religious activities to the second period.

In both cases, the second period utility will be the same because the individual is a church member with all the costs and benefits this implies. However, he or she trades off the (monetary) costs of being religious in the first period of life against the this-worldly benefits from religious affiliation in the first period and the higher probability of going to heaven in case of early church membership. The increased likelihood of a pleasant afterlife is present both if the individual dies after the first period and if he or she lives in the second period. Formally, the individual will postpone religiosity if

$$\xi C(y_1) > R_1 + P(A) * R_A$$
$$* \left[\frac{P_2(D)}{\delta_2} * [P(R;R) - P(N;N)] + \frac{\left(1 - P_2(D)\right)}{\delta_3} * [P(R;R) - P(N;R)] \right] \quad (2.59)$$

where $P_2(D)$ is the probability that the individual dies before period 2 starts. Note that afterlife consumption is discounted more heavily if the individual lives when old, $\delta_3 > \delta_2$.

If the second period income of the individual is so high that he or she will always be non-religious in the second period - no matter what the choice in the first period was[27] – the relevant decision is between being religious in the first period and then disaffiliating or being non-religious throughout the whole life. Again, the utility in the second period is the same, but secular consumption and current religious benefits in the first period as well as expected afterlife utility differ. The individual decides to renounce religiosity completely if

$$\xi C(y_1) > R_1 + P(A) * R_A$$
$$* \left[\frac{P_2(D)}{\delta_2} * [P(R;R) - P(N;N)] + \frac{\left(1 - P_2(D)\right)}{\delta_3} * [P(R;N) - P(N;N)] \right] \quad (2.60)$$

If the second period income of the individual is sufficiently high to disaffiliate in the second period, as determined by inequality (2.56), then inequality (2.60) is always fulfilled, i.e. the individual will be unchurched throughout his or her whole life. In other words, being a church member and disaffiliating when old is never a rational strategy. Of course, this result hinges on the assumptions that the income in the first period is higher than in the second, that current benefits of religion are not larger in the second period than in the first and that leaving the church during life is worse for the probability of enjoying an afterlife than not being religious at all. The latter point is somewhat contrary to the models I have presented earlier, such as in Section 2.2.3.1, where religious inputs in all periods have a positive effect on afterlife consumption.

Finally there might be some individuals whose second period income is high enough that being non-religious in both periods might be rational but not high enough that they would disaffiliate from the faith even if they had been religious when young. In other words, their second period income is between the two levels determined in (2.56) and (2.57). Those individuals compare the utilities of being religious in both periods with being unchurched

[27] This is the case described in equation (2.56).

throughout their whole existence. On the one hand, being religious causes (monetary) costs in both periods, on the other hand the individual has current benefits from being a church member in both periods and a higher probability of going to heaven regardless of whether he or she dies prematurely or not. The individual will decide to be non-religious if

$$\xi\left[C(y_1)+\frac{P_2(D)}{\delta_2}*C(y_2)\right] > \left[R_1+\frac{P_2(D)}{\delta_2}*R_2\right]+\left[\frac{P_2(D)}{\delta_2}+\frac{\left(1-P_2(D)\right)}{\delta_3}\right]*[P(R;R)-P(N;N)] \tag{2.61}$$

In all three cases a high (subjective) probability that an afterlife exists, high afterlife consumption or high current benefits from religion make being religious a more likely choice for the individual. The same is true if the individual believes that being a church member has a strong (positive) effect on the probability of going to heaven. These findings are in line with all other models that I have discussed in this chapter.

One central result of Papyrakis and Selvaretnam (2011) is that a decrease in the probability of dying young induces individuals to postpone church affiliation. This is formally proven by the authors for inequalities (2.59) and (2.61). One prediction of their model is therefore that demographic change causes the average age of denominational members to increase. This is in line with the model by Blomberg, DeLeire and Hess (2006) in Section 2.2.7.1, although the two models differ in many respects.

Papyrakis and Selvaretnam's (2011) model prominently shows that a high exogenous income in either of the periods makes being religious in that period less likely. However, it should be noted that this is partly due to the fact that in their model being religious does not reduce the income itself; instead, it reduces the utility from secular consumption derived from this income by a certain percentage. In that case, the utility loss from being religious grows with income. However, if the authors had assumed that being religious reduces the income, the result would have been less clear. This is because without further assumptions about the form of the utility function it would not be possible to determine whether the utility loss is higher for rich or poor people. While the duty to pay a certain share of one's income to a religious community leads to a larger reduction in income for wealthy individuals, it is not clear whether the burden is also heavier for them. It might be that for a millionaire it is easier to pay a certain percentage of his or her income to a religious community than for someone who can hardly feed his or her family.

2.3 Simultaneous determination of religious and secular charitable contributions

Although the models in Section 2.2 all take secular activities into account, they completely neglect non-religious charitable activities. While religious giving, m_R, can easily be interpreted as charitable contributions to religious communities, secular spending is usually thought to buy a secular consumption good. The models allow several predictions about charitable contributions to religion, e.g. that they should increase with age, they should be higher when the denomination offers significant afterlife benefits or provides important this-worldly benefits to the individual and that they should be higher if the individual has high opportunity costs of time, e.g. in the form of high hourly wages. However, the models do not allow for any direct predictions how religious and non-religious charitable contributions interact.

2.3.1 A simple approach

A rather simple modeling approach of religious and secular charitable contributions is presented in Hrung (2004) and Chang (2005). These two authors use a simplified Azzi and Ehrenberg (1975) model, but disregard secular consumption and interpret all non-religious spending of money (and time) as secular charitable activities.

In Hrung (2004: 733-735) the individual receives utility from secular charitable giving, m_{St}, $t = 1, \dots n$, in all n periods of his or her life as well as from afterlife benefits, R_A. Afterlife benefits depend on religious contributions in all periods of life, m_{Rt},

$$R_A = R_A(m_{R1} \dots, m_{Rt} \dots, m_{Rn}) \tag{2.62}$$

The Lagrangian function to be maximized is

$$L = U(m_{S1} \dots, m_{St} \dots, m_{Sn}, R_A) + \lambda \left(\sum_{t=1}^{n} \frac{(m_{Rt} + m_{St})}{\delta_t} - \sum_{t=1}^{n} \frac{y_t}{\delta_t} \right) \tag{2.63}$$

where y_t is the exogenous income in period t.

The following first-order conditions arise:

$$\frac{\frac{\partial R_A}{\partial m_{Rt}}}{\frac{\partial R_A}{\partial m_{Rt-1}}} = \frac{1}{1+i} \tag{2.64}$$

$$\frac{\frac{\partial U}{\partial m_{St}}}{\frac{\partial U}{\partial m_{St-1}}} = \frac{1}{1+i} \tag{2.65}$$

Note that in this simple model religious contributions only influence utility through afterlife benefits, since current religious benefits do not exist. In contrast, secular contributions directly affect utility.

From equation (2.64) it can be seen that religious contributions increase in time if an equal amount of contributions (in nominal terms) produces the same marginal utility in all periods (Chang, 2005: 7).[28] Of course, this conclusion depends on the fact that contributions to religion are depreciated, but produce the same amount of afterlife utility (Hrung, 2004: 734).

If the marginal utility of a fixed amount of giving remains constant also for secular giving, then one would expect to see an increase over the life-cycle of the individual. If, however, the marginal utility of a fixed amount of secular giving is higher in some periods of life than in others, one would expect to see a higher intensity of giving in these periods. (Hrung, 2004: 735)

Chang (2005: 5-7) derives exactly the same results for religious and secular giving, although his model is slightly more complicated and includes also time restrictions as well as different prices for religious and secular giving.

When looking at a single period t, the following equation must be fulfilled:

$$MU(R_A) * MP(m_{Rt}) = MU(m_{St}) \tag{2.66}$$

In each period the individual splits up religious and secular contributions such that their marginal contributions to utility are the same. If the individual believes that afterlife consumption cannot be bought with monetary contributions, the individual can produce only a low level of afterlife consumption R_A with a given monetary input m_{Rt}, which means that the marginal productivity of m_{Rt} will be low for all levels of m_{Rt} and in turn m_{St} will be high.

[28] A possible function for afterlife utility R_A which fulfils this requirement is $R_A = m_{S1} + \cdots + m_{St} + \cdots + m_{Sn}$.

2.3.2 Incorporating secular consumption and a time constraint

Clain and Zech (1999: 928-930) present a more complex model, in the sense that it distinguishes between secular consumption and secular charitable activities, which both enter the utility function of the individual, together with religiosity,

$$U = U(C, R, S) \tag{2.67}$$

where S is secular charity, C is consumption and R is religiosity. All commodities are produced by inputs of money and time. Since the model does not have a time dimension, religiosity can refer both to this-worldly and other-worldly aspects. The following production functions apply:

$$C = C(m_C, h_C) \tag{2.68}$$

$$R = R(m_R, h_R^V, h_R^A) \tag{2.69}$$

$$S = S(m_S, h_S) \tag{2.70}$$

An interesting feature of the model is that production of religiosity requires inputs of two different types of time-consuming activities: h_R^V, which is religious volunteering and h_R^A, which is time for worship and prayer.

The Lagrangian function to be maximized is

$$L = U(C, R, S) + \lambda(m_C + m_R + m_S - [\tilde{y} + w * (H - h_C - h_R^V - h_R^A - h_S)]) \tag{2.71}$$

The first-order condition concerning religious and secular giving yields

$$MU(C) * MP(m_C) = MU(R) * MP(m_R) = MU(S) * MP(m_S) \tag{2.72}$$

From equation (2.72) one can easily see that the individual tends to focus his or her giving on the sector that yields higher marginal productivity for a fixed amount of monetary inputs and/or higher marginal utility of the commodities produced. If the individual has strong beliefs in a blissful afterlife or hopes to profit from membership in a religious community, he or she tends to focus giving on religious purposes; he or she might switch to secular purposes if these yield high reputation for the individual or high intrinsic satisfaction. However, the marginal productivity of monetary inputs is also important. If, for example, the marginal productivity of monetary inputs in religion is low because the faith or the specific religious

community emphasize good deeds or intensive bible studies as the way to nourish religiosity, one would also expect religious giving to be low.

Turning now to the time use of individuals, first-order conditions require

$$MU(C) * MP(h_C) = MU(R) * MP(h_R^V) = MU(R) * MP(h_R^A) = MU(S) * MP(h_S) \quad (2.73)$$

Again, the time choices of the individual depend on the marginal utility of religious and secular activities, i.e. how much the individual values these two, but also on the marginal productivity, i.e. to what extent time spent volunteering for secular or religious charities or attending services and studying the bible influences the secular and religious commodities. For religious activities it must be true that

$$MP(h_R^V) = MP(h_R^A) \quad (2.74)$$

A religious person will primarily engage in those activities that yield the highest productivity in the production of religiosity, either volunteering and helping others or studying the faith and attending religious ceremonies. The marginal productivities are primarily determined by the rules and beliefs of the denomination. With the distinction between religious volunteering and religious study the authors allow for the possibility that individuals are heavily involved in religion, but still exhibit a low level of charitable religious activity. This is new in contrast to Hrung (2004) and Chang (2005) who interpret all religious activity as being of a charitable nature.

Another interesting part of the discussion in Clain and Zech (1999) is that they consider the possibility that the cross derivatives of the production function with respect to two different inputs can be either positive or negative. In all previous models, including those described in Section 2.2, it has been assumed that the chosen level of one input does not have an effect on the marginal productivity of another.

For example, the marginal productivity of secular giving could increase with the level of religious giving. One might think of someone who donates to a religious charitable organization. Thereby he gets in contact with other donors and learns about an interesting, trustworthy secular organization that he or she would also like to support. By giving to a religious charity, the individual can also increase the marginal productivity of his or her secular giving and one would expect that religious and secular charitable contributions increase simultaneously – in other words, they are complements.

The model of Clain and Zech (1999) therefore allows for the possibility that inputs in religious and secular charitable activities can be increased simultaneously, while the models of Hrung (2004) and Chang (2005) do not. If the marginal productivity of a certain type of charitable activity (religious or secular) depends on the level of the other type, the individual can simply reduce secular consumption in the world of Clain and Zech (1999). However, if secular consumption is left out of the model, as in Hrung (2004) and Chang (2005), then individuals cannot increase charitable religious and secular inputs simultaneously because of budget (and time) restrictions. Consequently, the models can lead to divergent results concerning the influence of religious activities on secular charities.

2.4 Institutional analysis of different church financing systems

2.4.1 Overview

The financing of religious communities takes multiple forms and differs from country to country. It depends on the relation of church and state in the particular country (Marré, 1991: 13-16) and on historical and cultural factors. Often religious communities rely on more than one form of financing. Marré (1991: 17), Kiderlen (1996: 37-38) and Hammer (2012: 68-78) distinguish the following sources of revenues: donations and fund-raising, fees for church services, interest from financial assets or profits from business activities, direct financing through the state, church taxes, obligatory church contributions, tax assignments and state support for facilities run by the church.

In countries where the state is neutral or hostile towards churches, the latter must rely on the contributions of their members or dividends on their own property. The same is often true for minority churches (Marré, 1991: 17). If they own financial assets or businesses, the resulting profits can be important sources of revenue. Otherwise they have to rely on members' contributions. One possibility is to raise fees for particular services, e.g. weddings or funerals. More common is to ask members for donations independent of their specific use of church services. This form of financing prevails in the US, but also in France and the Netherlands (Marré, 1991: 17). Governments can support voluntary contributions to religious communities by making them tax deductible. An advantage of financing through voluntary contributions is that the religious communities do not depend on the courtesy of the state. In addition, religious communities are forced to offer the kinds of benefits which their (paying) members desire. This has a positive aspect in that the churches have an incentive to satisfy their members' needs as best possible. A critical point is that conflicts may occur if members do not fully agree with the prevailing interpretation of the holy scriptures of their own denomination. Furthermore, giving might be directed to a few popular church projects, whereas other less well-known or unpopular church services which are nevertheless vital in the teachings of the denomination might lack financial resources (Feldhoff, 1996: 57). Funding churches only by voluntary giving might also result in a high dependency on a small group of the most generous givers and it might lead to a reduced scope of services in poor neighborhoods (Marré, 1991: 21). Pastors would also need to spend a large share of their time trying to secure funding, which leaves less time for spiritual guidance (Feldhoff, 1996: 56).

The models of individual choice on religiosity that were discussed in Section 2.2 often implicitly assume that churches are financed by voluntary contributions. This can be seen by the fact that in these models individuals can freely decide how much money they spend for religion and that decisions taken by religious communities themselves or the state do not play a role.

All other forms of church financing that were listed above rely on the cooperation of the state in one way or the other. Direct financing through the state is common in countries where state churches exist. The state pays the state church directly from tax revenues that are often collected from all citizens. Examples are Nordic counties such as Norway, but also the Greek Orthodox Church in Greece (Kiderlen, 1996: 42). This form of church financing entails a close connection between and mutual influence of church and state.

The state can also pay religious communities for providing education or welfare services to the public or for the maintenance of buildings of historical value. Such state financing is of considerable importance in Germany. Religious communities run schools, but also kindergartens, hospitals and nursing homes. A large share of expenditures for these facilities is remunerated by the state. This differs from direct state financing of churches in that the money provided is to be used for education, health or welfare services specified by the government; it is not at the free disposal of the religious community. In addition, other (secular) not-for-profit and for-profit organizations that provide the same services receive the same remuneration.

Finally, churches can finance themselves by levying church taxes or obligatory church contributions on their members or by participating in the tax assignment system. Although these instruments seem similar, they differ in some important details. The similarity is that churches – often in an agreement with the state – determine an amount of contributions that all members have to pay depending on the members' incomes (and sometimes also wealth). One difference to voluntary contributions is that the taxes or church contributions are obligatory and administered by the state itself or by the religious community with the help of the state legal system. Although many religious communities which rely on donations ask their members to give a certain share of their income and sometimes exert considerable pressure on their members to pay, they cannot provoke legal consequences on those who do not. Under a church tax system as it exists in Germany, Finland and parts of Switzerland, the national or local governments collect church taxes from citizens together with the national or local income taxes and they automatically apply the same force and legal instruments to

collect both types of taxes. In a system of obligatory church contributions, which exists in Austria, the church itself collects contributions on the basis of members' incomes. If a member refuses to pay, the church can take legal action against the member within the state's legal system. The church contribution in Austria has a lot of similarities with a membership fee in any voluntary organization. In church tax and obligatory church contribution systems individuals can avoid paying taxes and contributions by disaffiliating from the church. In contrast, if there is a tax assignment system in place, e.g. in Italy and Spain, all taxpayers – no matter what their religion is – need to pay a certain share of their income. They have the choice between contributing their money to a religious community or to the state, which uses the revenues for charitable, social or cultural purposes.

A disadvantage of the church contributions system – compared to church tax and tax assignment systems – are the high costs. For the churches it is more expensive to keep records of their members, the incomes of the members and to collect the tax than it is for the state which carries out all these tasks together with the levy of the income tax. Furthermore, taking legal action against taxpayers in default is not only costly but might harm the reputation of the church and is therefore used rarely – which makes church contributions appear voluntary and undermines tax equity. (Marré, 1991: 22-23) From a theoretical point of view, if payment of contributions was strictly enforced, the church contributions system would be very similar to a church tax system, but with a lower level of resource efficiency; if, however, payment was not enforced at all and churches had no reliable information on members' incomes, the church contribution approach would by very similar to a system of voluntary donations.

Table 2.3 gives an overview over some common ways of church financing and names some countries where these systems exist. However, it should be noted that often more than one type of financing is used in a country.

Table 2.3: Overview of types of church financing with example countries

Type of church financing	**Countries (examples)**
profits from financial assets, land and business activities	England, Portugal
voluntary contributions of members and fund-raising	US, Netherlands, France
obligatory church contributions	Austria
church tax	Germany, parts of Switzerland, Finland, Denmark, Sweden
tax assignment	Italy, Spain, Hungary
state remuneration of social services provided by churches	Germany
direct state financing	Norway, Greece, Luxemburg

Data sources: Marré, 1991: 17-29; Hammer, 2012: 68-78.

In what follows, I concentrate on three types of church financing: the voluntary giving system, with the US as an example; the church tax system as it exists in Germany; and the tax assignment system according to the Italian and Spanish examples. These three systems were chosen for various reasons. First, the US system has already been modeled in the previous literature and it is also a system where individuals make decisions freely without any external restrictions. It will therefore serve as a benchmark to which the Italian and the German systems will be compared. Second, the church tax and tax assignment systems are rarely discussed in scholarly articles on the economics of religion, whereas other arrangements like state financing is in the focus of researchers. Third, interest lies in choices of individuals or households. However, if churches finance themselves through business activities or interests, or if they receive state funding, decisions are taken by the church and the state, respectively, and not by individual church members. Fourth, opponents of the church tax system in Germany often suggest a reform of the church financing system and the introduction of church financing through a tax assignment system or through completely voluntary contributions without any state interference. (see Branahl, 1992: 34-42; Feldhoff, 1996: 41-48) These two are in fact the most viable options for Germany, while other options appear inapplicable: Direct state financing is at present neither in the interest of the major German churches nor the German state. It would also run counter to the prevailing interpretation of the German constitution *("Grundgesetz")* which guarantees freedom of religion. Freedom of

religion includes the right not to have a religion and not to be forced to contribute financially to a religious community. Levying church contributions as in Austria is also not an attractive alternative to the church tax system because it is very costly while at the same time revenues are lower than in a church tax system and tax equity is negatively affected.

I now explain the voluntary giving system in the US, the church tax system in Germany and the tax assignment system in Italy (and Spain) in some more detail since they will be taken up in the model in Chapter 3.

2.4.2 Voluntary giving to religious communities in the US

Voluntary giving by members makes up the largest share of revenues of religious communities in the US (Chaves, 2002: 42). How the communities encourage their members to pay and how they collect the money depends on the traditions and the teachings of each denomination (Chaves, 2002: 49). Some denominations expect their members to give generously, independent of the community's specific needs. Others ask members to give for well-defined projects or activities. Some denominations request tithing, i.e. giving a certain percentage of one's income, traditionally 10 %. Members can also be asked to pledge, i.e. making a commitment to give a certain amount of money over a period of time. Requests for giving can be voiced during or after services, or members might be contacted by mail, phone or personally at home (Miller, Parfet and Zech, 2001: 46-47). Members can also be asked to give money regularly, usually on Sundays and holidays, using envelopes handed out for this purpose. Again, members are expected to give according to their income. (Fischer, 2005: 314) Giving to religious organizations is usually tax-deductible. For the model that follows, the most important feature of this financing system is that individuals freely determine the amount they give and that this amount is not directly connected to the individual's income. In reality, social pressure can induce individuals to give at least a minimum amount (Meuthen, 1993: 186) and certainly most people would agree that one should give more the more one earns. But since religious communities have no right to review member's income statements or tax declarations, the final decision remains with the individual.

US citizens are often considered very generous when it comes to voluntary giving, in particular giving to religious congregations (Marré, 1991: 18). Empirical studies seem to support this view. In a telephone survey of more than 4,000 Americans above the age of 21 it was found that in the year 2000 only around 11 % of households did not make a charitable contribution and the average size of the contribution was $1,620, which corresponds to 3.1 % of household income (Independent Sector, 2001a: 17).

The same survey found that of those households who do give, roughly 10 % give only to religious congregations[29], 59 % give to religious congregations and secular purposes and 31 % give only to secular organizations. When it comes to the amount given, those who give to both causes make the largest contribution (of which 58 % are assigned to religious congregations), followed by purely religious and purely secular givers. (Independent Sector, 2001b: 11-13)

2.4.3 The church tax system in Germany

In Germany, the major source of revenues for the two large Christian denominations (Roman Catholic and Protestant) is church taxes collected from their members (Daiber, 1995: 70).[30] The church tax is an additional tax to the income tax. It amounts to 8 % or 9 % of a member's income tax payments. Which tax rate applies is dependent on the region where the individual lives, because religious communities have regional organizations which negotiate – within certain limits – the relevant church tax rate for their members with the regional government. Church taxes are collected by state tax offices along with income taxes.[31] Therefore government has to be informed who is a church member and who is not. Church membership usually starts with baptism; individuals who were baptized as children are automatically considered church members until they disaffiliate. Church disaffiliation generally has to be declared formally before government employees. An administration fee of up to 60 euro is charged. The duty to pay church taxes terminates after church disaffiliation. (see also Daiber, 1995: 71-72)

The particularities of the German church tax system evoke some problems. First, the state needs to be involved in church membership issues, which are typically the concern of religious communities themselves. However, since the state collects taxes on behalf of the religious communities, but on the other hand guarantees religious freedom – which involves each citizen's right not to be religious and not to support any religious community financially – it needs to provide the opportunity for citizens to disaffiliate from the church and elude the duty to pay church taxes. The consequences within the religious community of a church disaffiliation that is only declared before government officials is a much-debated topic (see also footnote 43).

[29] The term "religious congregations" here refers only to places of worship, excluding any charities that are in some way connected to them.
[30] Some smaller religious communities such as the Old Catholic Church *("Altkatholiken")*, Religious humanist communities *("freireligiöse Gemeinden")* and some Jewish communities also participate in the church tax system.
[31] An exception is the federal state Bavaria, where churches run their own tax offices.

Second, there are some complications when married couples are jointly assessed for the income tax, but only one of them is a church member. If both spouses contribute to the family income, church taxes are only levied on the income of the church member. However, some couples decide to split their responsibilities such that only one partner earns a market income and the other does family work. In that case it is assumed that the partner without own income has a right to some of his or her spouse's income and consequently needs to pay church taxes on his or her share of that income (see Petersen, 2010: 75-76). In practice, the joint taxable income of the couple is calculated according to the regulations of the Income Tax Law. In a second step, a graduated tax plan is applied. This regulation disincentivizes family constellations where the partner earning the family income disaffiliates from the church in order to save church taxes and the partner without his or her own income remains a church member and secures the family access to benefits for church members.

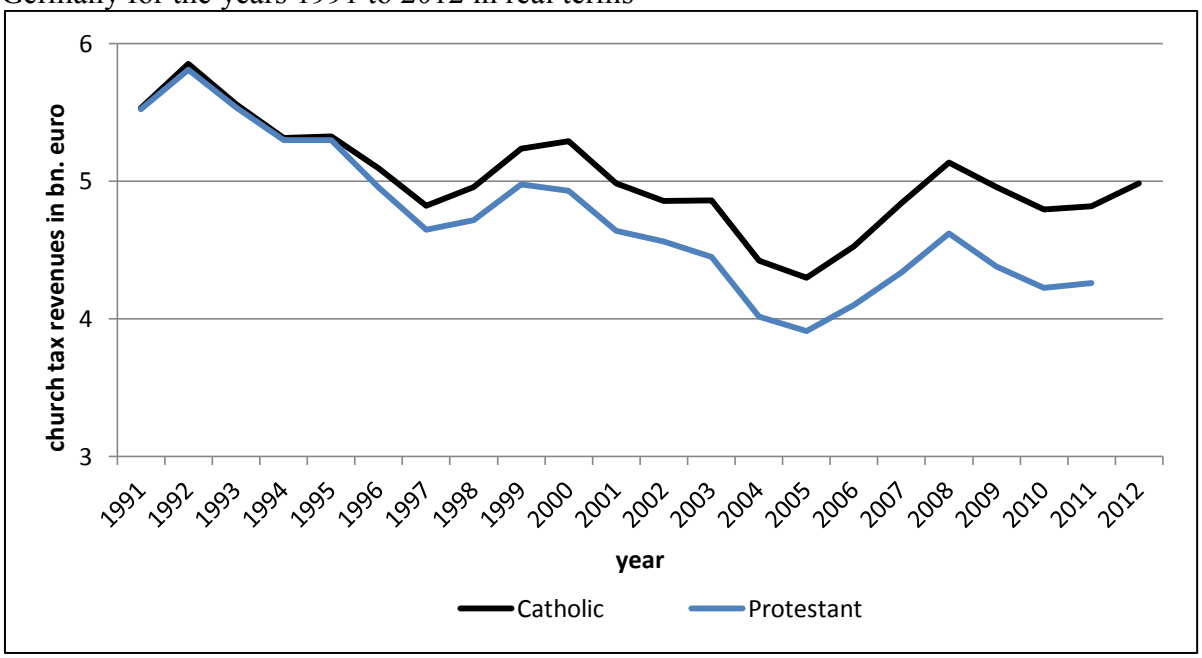
Third, churches face the problem that people might disaffiliate only to save church taxes. For this reason, there are some special regulations that are meant to ease the tax burden especially for members with high incomes. Many regional churches have introduced maximum church tax rates. Since the income tax in Germany is progressive, the church tax is progressive as well, i.e. the amount of church tax as a share of income increases as income increases. The maximum church tax rate secures that above a certain amount of income the church tax increases only linearly with income.[32] As well, there are some hardship regulations that release church members from paying the full amount of taxes if they have an extraordinarily large one-time income, such as a compensation for loss of office.

Figure 2.1 reports church tax revenues of the Protestant Church in Germany *("Evangelische Kirche in Deutschland")* and the Catholic Church for the years 1991 to 2012 in real terms, i.e. they are inflation-adjusted using the consumer price index for Germany with the base year 2010. The data strongly suggests that both churches face the same changes in revenues over time. However, in the early 1990s the Catholic and the Protestant Church received almost the same amount of church taxes from their members, but ever since the gap in revenues has been widening steadily and currently the Catholic Church receives more than 500 million euro more in church taxes than the Protestant Church. Taken together, in the last few years total church tax revenues amounted to more than 9 billion euro. In nominal terms, the church tax

[32] The regulation differs from the income tax scheme. In the income tax scheme, above a certain income the marginal tax rate on an additional euro of income is constant (currently at 45 %), and the average tax rate converges towards the maximum marginal tax rate. In the church tax scheme, the tax ceiling entails a constant average tax rate.

revenues of the Protestant Church have fluctuated around 4 billion euro since the beginning of the 1990s. Only during the economic upturn between 2005 and 2008 was there a strong increase to well above 4 billion euro. For the Catholic Church I find a similar pattern, although at a slightly higher level. In real terms, however, both churches have continuously lost revenues, interrupted by two periods with increasing revenues from 1997 to 1999 and 2005 to 2008.

Figure 2.1: Church tax revenues of the Protestant Church and the Catholic Church in Germany for the years 1991 to 2012 in real terms



Data sources: Deutsche Bischofskonferenz (n.d.), Statistisches Bundesamt (1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005 2006, 2007, 2012d).
Note: Numbers indicate church tax revenues excluding local church taxes less administrative costs paid to the state tax offices. Revenues are adjusted for inflation using the consumer price index for Germany (2010=100) (Statistisches Bundesamt, 2013c).

In 1991, the Protestant Church reported 29.2 million members (36.4 % of the German population), while the Catholic Church reported 27.7 million members (34.5 % of the German population). These numbers dropped to 23.6 million Protestant members and 24.5 million Catholic members in 2011. Simply dividing the church tax revenue (in 2010 prices) by the number of members shows that the average amount of church tax paid in 1991 was 189 euro for a Protestant and 200 euro for a Catholic. The numbers declined to 154 euro and 166 euro, respectively, in 2005. Afterwards there was a considerable increase to 180 euro and 197 euro, respectively, in 2011, which corresponds almost to the level in the early 1990s. However, it

should be noted that a considerable share of church members do not pay any church taxes at all, which means that the average burden of those who pay church taxes is much higher.[33]

Data on voluntary contributions (other than church taxes) is more difficult to find for Germany. Sommerfeld and Sommerfeld (2010) report the results of various surveys and statistics. They conclude that there is no solid statistical base to determine the share of people who give to charities, but estimate the total yearly amount given in the period 2006-2008 to be roughly 5 billion euro (Sommerfeld and Sommerfeld, 2010: 44-46). Of this sum, presumably only a minor share goes to religious organizations. The Protestant Church reports that in 2005 (the latest data made available) it had revenues from donations and offerings during services of 266 million euro, which amounts to 2.7 % of their total revenues (Kirchenamt der EKD, 2012: 37).

2.4.4 The tax assignment system in Italy

The main source of revenues for religious communities in Italy – originally only the Catholic Church, other religious communities joined the system later – is the so called *"otto per mille"* ("eight per thousand"). The basic idea of the system is that each taxpayer has the possibility to assign a share of 0.8 % of his or her income tax payments either to a religious community or to the state. The religious communities which participate in the system are: the Catholic Church, which is by far the largest beneficiary, the Waldensians, the Seventh Day Adventists, the Jewish community and the Lutheran Evangelical Church. The choice for the receiver of the assignment tax is to be signaled on the income tax return. The money that is assigned to the Catholic Church is to be used for supporting the faith, paying the clergy and for charitable activities in Italy and in the Third World. The state is also supposed to use the money for social support or humanitarian causes, in particular fighting famine all over the world, help in case of natural disasters and help to refugees as well as to conserve Italian cultural heritage. The total tax revenue is split up according to the choices expressed by taxpayers, which means that the individual taxpayer does not decide how his or her *"otto per mille"* is used, but has a say in how the total amount of tax collected is allocated. The revenue coming from taxpayers who do not make a choice is split up according to the decisions of those who have chosen one of the alternatives.[34]

[33] Data on church membership numbers in 1991 and 2005 are taken from Eicken and Schmitz-Veltin (2010: 589); membership numbers in 2011 are taken from Sekretariat der Deutschen Bischofskonferenz (2012) and EKD (2012).

[34] The most important regulations described in this section are stipulated in law nr. 222 of 1985, articles 47 and 48.

In 2011, the total tax amount to be assigned to one of the destinations was 1.149 billion euro, of which 152 million went to the state and 977 million went to the Catholic Church. Of all taxpayers, 43.5 % made an assignment choice, of which 85 % chose the Catholic Church and 11.9 % chose the state.[35] (Camera dei deputati, 2010) These shares equal the average shares for the whole period since the introduction of the tax assignment system (Servizio studi del Senato, 2012).

Tax assignment systems also exist in Spain and Hungary. In Hungary, several religious communities profit from the system (Schanda, 2009). In Spain, the Catholic Church is the only religious community profiting from the tax assignment system. It receives a share of 0.7 % of the income tax of those taxpayers who assign their tax to the church (Ibán, 2009: 315). Until recently the Spanish state subsidised the Catholic Church by guaranteeing a minimum amount of revenue for the church in case the tax assignments did not suffice (Garcimartín Montero, 2006: 185). Similar to the Italian system, if the taxpayer does not choose to assign his or her taxes to a religious community, it is used for charitable purposes. Those purposes cover a larger scope of activities, they should be "carried out by the Spanish Red Cross and other non-governmental organizations" and benefit "the elderly, people with physical, mental or sensory disabilities, people unable to work, people suffering from drug addiction or dependence, and the socially marginalized" or can go to "underdeveloped countries" (Royal Decree 825/1988; cited after Garcimartín Montero, 2006: 182, footnote 25). The taxpayer also has the opportunity to choose both the Catholic Church and charitable organizations; in that case, 1.4 % of his or her income tax is split between the two purposes (Ferreiro Galguera, 2009: 148).

The overall idea behind the tax assignment system is that taxpayers are free to choose between financing a religious community and supporting a secular charitable cause (Pistolesi, 2006: 179). Their available income always remains the same.

2.4.5 Comparison of church financing systems in the US, Germany and Italy

A similarity between the Italian and the German system of church financing is that both take the income tax as the basis for calculating church contributions, although in Germany the church tax is an additional tax to the income tax and in Italy taxpayers can assign a part of their "regular" income tax to the church. In both countries, this results in a strong dependency

[35] The share of revenues of the state is higher than 11.9 % since some of the smaller religious communities only receive a share of revenues equalling the share of taxpayers who have expressed a choice and chosen the respective religious community. The state receives their share of revenues from taxpayers who have not expressed a choice.

of church revenues on state income tax legislation, in particular the tax rate and the definition of taxable income (see Carmignani Caridi, 2006: 161). A striking example is public pensions in Germany, which have been predominantly tax-free until recently. As a consequence, the majority of pensioners did not pay income tax (unless their pensions were very high or they had some other sources of income) and they did not pay church taxes as well. In other words, a group whose church involvement is disproportionately high had no obligation to contribute even if they were financially able to do so – caused by the government definition of taxable income.[36] This is in sharp contrast to the US, where one would expect that people base their religious giving decision on religious involvement and their overall income, taxable or not. In fact, research from the US shows that giving to religious communities by the elderly is disproportionately high (Hrung, 2004: 742).

Another aspect that distinguishes the German and Italian from the US system is that in Germany and Italy churches are free to use their church tax/assignment tax revenues in the way they prefer. Taxpayers have no say in the use of the money, whereas in the US giving is voluntary and can always be earmarked for the use in a particular project.

Religious communities in all three countries depend on a positive attitude of their members, as well as taxpayers in the cases of Italy and Germany, towards these communities. In Germany, taxpayers can decide to disaffiliate from the church; in Italy, taxpayers can simply assign their taxes to the state or a different religious community; in the US, members can lower their contributions or switch to another religious community. In all countries this is a source of uncertainty for religious communities since they heavily rely on (tax) revenues to pay their clergy.[37] Concerning uncertainty, the church tax system and the tax assignment system are in the middle between two extreme ends that are marked by complete state financing of churches on the one side and voluntary contributions on the other side. In countries where the government provides all funding for religious communities churches are financially completely independent from temporary changes in the public opinion. Still, church tax and tax assignment systems provide a more stable source of revenue than voluntary contributions because in the German context church disaffiliation is a significant

[36] Such a view is only correct in a cross-sectional perspective. From a longitudinal point of view pensions were already taxed when the individual was actively working and earned income, since contributions to the pension insurance were not tax-exempt. This changed in 2005. Since that time contributions to the pension insurance are tax-exempt and pensions gradually become part of the taxable income. In both tax systems the total amounts of income tax and church tax paid are the same, but in the present system payment is extended to a longer period of time. As a result, at each point of time a larger share of church members pay church taxes.

[37] Before the system of *"otto per mille"* was introduced in Italy in 1987, the state subsidized clergy that were not able to live from other sources of income (Petersen, 1997: 162).

decision for many (former) church members that is not easily reversed and in the Italian context contributions need to be paid anyway and the number of alternative recipients is limited.

One important difference of the US system and the Italian system compared to the German case is that there is no need for the state to define membership in a religious organization. The state has no incentive to keep books about who is a member, who joins a religious community and who disaffiliates. Consequently, there is no necessity to discuss the rather complicated issue of which consequences religious communities attribute to a church disaffiliation that is declared in front of state officials. (Carmignani Caridi, 2006: 142)[38]

The Italian system completely disconnects affiliation with a particular religious community from the obligation to contribute to its financial resources. In fact, smaller religious communities, such as the religious Jewish community, are chosen by four or five times more taxpayers than what one would expect given the size of their membership (Carmignani Caridi, 2006: 145). This is in sharp contrast to the German situation, where members are obliged to contribute, while non-members only have the possibility of making voluntary donations to religious communities.

Since the marginal cost of church membership in Italy is zero, there is no significant financial incentive to disaffiliate. The weighing of benefits and costs which characterizes church membership decisions in Germany does not exist in Italy. At the same time, it is impossible for churches to base the benefits that they provide to their members on their willingness to contribute financially, since this is not observable.

Another difference between the Italian and the German system is the weight that is attached to each taxpayer. In Italy, the tax amount is partitioned according to the share of taxpayers who make an assignment choice. Each taxpayer has the same amount of influence on the final outcome. (Petersen, 1997: 164) In Germany the churches directly receive the taxes their own members pay. Therefore the total church tax revenues depend on the number of members and on the average income of the members in comparison to the average taxpayer.

[38] According to Carmignani Caridi (2006: 142), avoiding these problems was one of the reasons why the system of *"otto per mille"* was chosen in Italy instead of a church tax on the model of the German system.

2.5 Conclusions

In this chapter I have reviewed previous approaches to modeling individual and household decisions on religiosity, in particular pecuniary and time inputs into religious activities, in a rational choice framework. I have also summarized models relating religious activities to secular charitable contributions of time and money. Subsequently, I have briefly described three different systems of church financing: the reliance on voluntary contribution in the US, the church tax system in Germany and the tax assignment system in Italy and Spain.

The literature review in Section 2.2 has demonstrated that the rational choice approach can fruitfully be used to explain religious behavior. Demographic variables such as age, socio-economic variables such as religious upbringing and income, but also faith-related variables like beliefs about the afterlife, subjective probabilities of the existence of God and variables related to the religious group such as current benefits from religious membership and average devotion of fellow members can have an influence on individuals' current level of religiosity.

Section 2.3 has pointed to the fact that theoretical approaches modeling the simultaneous decision on religious consumption and secular charitable activities are sparse. They provide heterogeneous conclusions as to whether these two types of commodities are substitutes or complements.

Section 2.4 has provided a brief overview of different ways through which religious communities are funded, with a focus on systems of voluntary contributions as in the US, the church tax system in Germany and the tax assignment system in Italy. There are some similarities, but also a lot of differences between these approaches.

The analysis has revealed insights but also shortcomings and gaps in the research which I try to fill with my own theoretical model:

First, all previous models are well-suited to describe the religious market in the US, where individuals are free to contribute to religious organizations, and congregations are responsible themselves for keeping records of their members. However, the models are less suitable to describe the church financing systems in many European countries and the incentives the individuals face there. In particular, the models disregard the binary choice concerning church membership and they do not allow for the exogenous determination of the minimum amount of compulsory church contributions. Most previous research applies only a marginal analysis which is unsuitable to explain non-continuous decisions. In such a model, non-religiosity would appear if the marginal utility of religiosity was zero for all levels of religiosity that the

individual can achieve given his or her resources (e.g. there is a minimum level of financial resources required in order to receive any religious benefits which exceed the total income of the individual) or if the marginal utility of religiosity is so low that it does not exceed the marginal utility of consumption (e.g. if the individual is so poor that he or she exhausts his or her resources in order to secure the survival of his or her family). However, in order to account for the particularities of the church tax and tax assignment systems, it is necessary to model discrete choices and the weighing of overall benefits and costs.

Analysis of discrete choices in religion is carried out in the models of Durkin and Greeley (1991), Melkonyan and Pingle (2009) and Papyrakis and Selvaretnam (2011) presented in Section 2.2.7. The focus of these models is to explain how rational individuals make church membership decisions facing insecurity about the existence of God. In order to do so, they make some simplifying assumptions, such as fixed costs of religious membership. This does not accurately represent the German church financing system. Neither do the models provide for the possibility of making voluntary contributions in addition to compulsory church contributions, nor do they help to understand the effects of church contributions based on income. Considering the tax assignment system in Italy, the existing models are not at all helpful in explaining the decision as to whether to assign taxes to a religious community or the state.

Second, secular voluntary contributions are also disregarded in these discrete choice models, while the models discussing the interrelation of religious and secular contributions (see Section 2.3) do again not account for the discrete choices characterizing many church financing systems in Europe.

Third, previous theoretical approaches distinguish between this-worldly and afterlife benefits from religious contributions. The nature of afterlife benefits is usually derived from the teachings of the religious community, although it is debatable whether they should be modeled as depending strictly positively on individuals' inputs. Characteristics of this-worldly benefits are also discussed; they include commodities as diverse as private religious festivities, business contacts, access to the marriage and part of the labor market, enjoyment of services, meaning in life, and personal support in case of need. However, all these benefits are modeled in the same way, as a commodity in the utility function that depends on money and time spent for religiosity. In such a framework it is difficult to determine how different ways of making religious contributions – either through taxes or through donations – affect religious benefits.

Fourth, in previous models it is assumed that individuals derive current utility from every euro they give to religious communities, even if the marginal utility is decreasing. This assumption seems hard to maintain in tax systems where religious communities decide independently about the use of their revenues and taxpayers have no possibility to earmark their contributions for activities they prefer.

In the next chapter I will determine a model that incorporates these neglected features of the decision concerning religious spending.

3 A MODEL OF RELIGIOUS CONSUMPTION WITH A FOCUS ON DIFFERENT SYSTEMS OF CHURCH FINANCING

3.1 Introduction and research questions

The aim of Chapter 3 is to develop a theoretical model which contributes to understanding individual decision making on religiosity under the three different institutional arrangements concerning church financing that were introduced in Section 2.4 (the voluntary contribution system in the US, the church tax system in Germany and the tax assignment system in Italy) and to derive hypotheses as to how these institutions affect church membership decisions, voluntary (monetary) contributions to religious organizations and to secular charities. The research questions to be answered are:

- *Does the institutional framework affect decisions on religious and secular charitable giving? Which are the variables that influence the decision on the amount given and the division of contributions between religious and secular beneficiaries?*
- *Does the institutional setting influence the church membership decision? If yes, which variables affect the decision and how?*

The basic assumption underlying my model is that there are two types of charitable activities – religious and secular – and that the individual cares about both, possibly to varying degrees. I assume that individuals receive an intrinsic satisfaction from giving to these charitable causes. I do not make any assumptions about whether it is the act of giving itself or the contribution to the public good that creates utility.[39] In practical terms this means that the amounts given to both religious and secular charitable causes appear in the individual's utility function. The model treats church taxes and contributions in the tax assignment system as imperfect substitutes for voluntary charitable contributions, but with an exogenously given total amount.

[39] Andreoni (1989, 1990) distinguishes two types of utility from charitable giving: "warm glow" indicates the part of an individual's utility that directly derives from the amount given, while "altruism" is the utility that is generated by the size of the public good, which depends on own contributions, but also on contributions of all other individuals in society (and possibly the government). This distinction is important for the discussion of crowding-out of contributions to the public good. However, in my theoretical framework the public good is not explicitly modeled and crowding-out does not exist. Therefore a differentiation between "warm glow" and "altruism" is not necessary. I return to this point in Section 3.6.3 when I discuss the welfare implications of the different church financing systems.

My model incorporates the discrete decisions that the institutional arrangements in the German and Italian church financing systems imply, in particular the church membership decision in Germany and the decision who should be the beneficiary of the assignment tax in Italy. Moreover, it attempts to explain the decisions about secular giving. This allows a comparison of church financing systems in the US, Italy and Germany, especially with respect to the level of religious and secular contributions. The model also accounts for the fact that religious communities in Italy and Germany decide about the use of tax revenues independently from the influence of taxpayers.

Despite all the differences and innovations, my model follows the basic features of previous theoretical approaches. In particular, I model a single individual[40] who maximizes utility deriving from secular consumption and religiosity. Most features of the model are kept as simple as possible. There is only one period, as, for example, in the model of Neuman (1986). This has several implications. First, no discounting is necessary. Second, the difficult question of afterlife benefits can be circumvented. Although in the model religious benefits can easily be interpreted to incorporate afterlife benefits, I interpret them to be this-worldly benefits. That way, the uncertainty about the existence of God is excluded from the model and I need not make any assumptions about the production function of afterlife benefits, e.g. if they increase in religious activity. What is more, only a minority of individuals in Germany believe in life after death (Köcher, 2009: 803), therefore it would not be wise to put too much emphasis on the afterlife when explaining church membership and church contribution decisions in Germany.

Another simplification of my model in comparison to the existing literature is that I only consider monetary inputs, not the input of time into the production of religious and secular commodities. The reason for this is that my main interest lies in the different church financing systems and their effects. Church taxes and assignment taxes are only defined in monetary units; they cannot be substituted by inputs of time. In a similar vein, church membership in Germany is dependent on the payment of church taxes and does not imply any requirements of time spent with religious activities. Since the time dimension is left out of the model, the income of an individual is exogenously given instead of earned through time-intensive labor activities.

In contrast to previous models discussed in Section 2.2, I also make specific assumptions about the forms of the utility function and the production function of each single commodity.

[40] In order to keep the formulas simple, the subscripts to denote the individual are suppressed.

The model is to the best of my knowledge the first formal model that compares church financing systems, in particular the church tax and the tax assignment system, with a microeconomic analysis. However, it is not the first analysis of the economic incentives on voluntary giving that the German church tax system implies. In fact, Borgloh (2012) provides such a model. In Section 3.4 I discuss in some detail similarities and differences of Borgloh's (2012) model and my own.

I start by presenting the general model framework and then incorporate the specific features of the voluntary contribution, church tax and tax assignment systems. At the end of the chapter I discuss the welfare implications of the church financing systems, analyse some recent suggestions to change or reform the financing of churches in Germany and Italy, discuss how model results change when individuals are motivated to give through the prestige raised by charitable behavior, and summarize the hypotheses derived from the model.

3.2 The general model

I assume that individuals have an exogenously given income y and a utility function that depends on the amounts of secular consumption m_C, effective religious charitable contributions of the individual g_R, effective secular charitable contributions g_S as well as on the church membership status D_M:

$$U = U(m_C, g_R, g_S, D_M) \tag{3.1}$$

More specifically, I assume that the utility function is

$$U = {m_C}^{1-\beta_1-\beta_2} * {g_R}^{\beta_1} * {g_S}^{\beta_2} + D_M * U_{memb} \tag{3.2}$$

where U_{memb} are membership benefits and $0 \leq \beta_1, \beta_2 < 1$ and $\beta_1 + \beta_2 < 1$. Secular consumption and effective charitable contributions are assumed to be non-negative, $m_C, g_R, g_S \geq 0$.

The utility function consists of two additive parts. The first part captures the utility from consumption and from charitable giving. It has a standard Cobb-Douglas form with parameters β_1 and β_2. The Cobb-Douglas type was chosen because it is common in economic models and easy to handle. In addition to the Cobb-Douglas utility, the second part of the utility function captures the utility of church membership U_{memb}, $-\infty \leq U_{memb} \leq \infty$. The utility from membership in religious groups is different from the other commodities because the individual cannot choose a level of U_{memb} from a continuous set of alternatives, he or she can only choose to be a member (and receive the utility U_{memb}) or not. This binary decision is captured with the indicator variable D_M. The utility of church membership can be positive or negative.

For both religious contributions g_R and secular charitable contributions g_S, two types of contributions can be distinguished: taxes such as the church tax in Germany and the assignment tax in Italy as well as additional, completely voluntary donations. The latter type of completely voluntary religious and secular donations is represented by m_R and m_S, respectively. Taxes and voluntary donations are assumed to be non-negative.

Taxes are modeled in a simple way by applying an exogenously determined tax rate τ to the income y, such that the amount due is exogenous to the individual. I assume further that the individual has clear preferences for which specific causes his or her donations should be used. When it comes to additional religious and secular giving m_R and m_S, the individual is

completely free not only about the amount he or she gives but also to choose a specific cause for which the money must be used in line with the individual's preferences. In contrast, taxes are managed by religious or secular organizations (such as the state) which decide about the use of the funds. Therefore the beneficiaries of taxes often do not fully coincide with people's preferences. In Germany, one of the justifications that is given for the collection of church taxes is that churches can use their revenues in the way they prefer without asking for the assent of taxpayers (see, for example, Kirchhof, 1996: 56). They argue that they can support important charitable causes that do not receive much support otherwise (see Feldhoff, 1996: 57). Such arguments suggest that revenues through taxes are not fully used in the way the single tax payer prefers. I therefore assume that only a fraction $e, 0 \leq e \leq 1,$ of the taxes are used for causes the individual agrees to. I call e a fitting parameter.[41] It varies between taxpayers. The fitting parameter is 1 if the use of funds by the institution collecting the taxes is completely in line with the preferences of the taxpayer. Since the perception of the use of revenues by religious and secular receivers of the tax can vary, I use separate variables when referring to churches or the state. In the following, a indicates the fitting parameter in relation to the church and b indicates the fitting parameter when the state receives the tax,

$$e = \begin{cases} a, & if\ church\ receives\ tax \\ b, & if\ state\ receives\ tax \end{cases} \tag{3.3}$$

I argue that the individual only receives utility from paying taxes that are used according to the individual's preferences, i.e. the fraction $e\tau y$ of the overall tax amount τy. The remainder of the tax amount, $(1-e)\tau y$, does not provide any utility to the individual. Consequently, the personal benefits generated from giving do <u>not</u> depend on total charitable expenditures of the individual, which are $D^{rel} * \tau y + m_R$ in the case of religious contributions and $D^{sec}\tau y + m_S$ in the case of secular contributions, instead they depend on effective giving g_R and g_S, where

$$g_R = D^{rel} * a\tau y + m_R \tag{3.4}$$

and

[41] Ribar and Wilhelm (2002: 435) use similar parameters to characterize the efficiency of different charitable institutions. However, in their model the efficiency parameters are objective, in the sense that they capture the share of charitable expenditures that is actually used by the institution to create public goods. In my model the fitting parameters are subjective, capturing the share of expenditures that is earmarked for purposes which generate utility for the individual.
Meuthen (1993: 196) also elaborates on the idea that church tax payers and tax payers in the tax assignment system cannot decide freely about how their taxes are used. In contrast, non-members in a church tax system can spend their money completely according to their preferences (also for charitable purposes) (p. 196) and church members in the voluntary giving system can earmark their contributions such that they "correspond to their actual preferences" (p. 184 [my own translation]).

$$g_S = D^{sec} * b\tau y + m_S. \quad (3.5)$$

D^{rel} and D^{sec} are indicator variables taking on the values zero or one. D^{rel} (D^{sec}) only takes on the value one if in a given institutional environment religious (secular) charitable organizations are financed via taxes and the individual actually assigns his or her taxes to the church (the state).

While the utility function of the individual only takes up effective contributions g_R and g_S, the budget constraint necessarily includes the total amount given. In general, the individual can spend his or her income y on secular consumption m_C, on taxes for religious or secular charitable purposes and on additional voluntary giving m_R and m_S.

The resulting budget constraint of the individual is

$$y - D^{rel} * \tau y - D^{sec} * \tau y = m_C + m_R + m_S \quad (3.6)$$

In all three institutional systems, the individual chooses the utility-maximizing levels of $m_{R,}$ m_S and m_C. In addition, he or she decides about the church membership status D_M and – as far as the institutional setting provides for the possibility – about the assignment of his or her taxes to the church or the state, D^{rel} or D^{sec}.

3.3 The voluntary giving system

3.3.1 The giving decision

The particularity of the US system of financing charitable activities is that there are no compulsory and strictly income-dependent contributions such as taxes, therefore D^{rel} and D^{sec} are zero by definition. Consequently, purely voluntary contributions m_R and m_S equal effective contributions g_R and g_S. Plugging this information into the utility function and the budget constraint, I obtain the following Lagrangian function

$$L^{vol} = {m_C}^{1-\beta_1-\beta_2} * {m_R}^{\beta_1} * {m_S}^{\beta_2} + D_M * U_{memb} + \lambda(m_C + m_R + m_S - y) \tag{3.7}$$

Maximizing the utility function subject to the budget constraint, I receive the following solution. It will be the benchmark against which the tax financing systems are analyzed:

$$m_R^{bench} = g_R^{bench} = \beta_1 y \tag{3.8}$$

$$m_S^{bench} = g_S^{bench} = \beta_2 y \tag{3.9}$$

$$m_C^{bench} = (1 - \beta_1 - \beta_2) y \tag{3.10}$$

Total giving is

$$m_R^{bench} + {m_S}^{bench} = (\beta_1 + \beta_2) y \tag{3.11}$$

The results are standard results in a Cobb-Douglas world. The consumption of each commodity is determined by the income of the individual and the respective Cobb-Douglas parameter. The church membership status and the benefits from membership do not have an effect on charitable giving, which is in line with the assumptions made when setting up the model.

3.3.2 The church membership decision

As could be seen from the utility maximization above, the church membership decision is completely disregarded in the decision on voluntary giving and can be considered a separate problem. The individual simply chooses the church membership status (member or non-member) that maximizes his or her utility. In order to see this more clearly, I insert the utility-maximizing levels of m_R, m_S and m_C into the utility function

$$U^{vol} = (1 - \beta_1 - \beta_2)^{1-\beta_1-\beta_2} * {\beta_1}^{\beta_1} * {\beta_2}^{\beta_2} * y + D_M * U_{memb} \tag{3.12}$$

For ease of notation, I define $\mathcal{Z} \equiv (1 - \beta_1 - \beta_2)^{1-\beta_1-\beta_2} * {\beta_1}^{\beta_1} * {\beta_2}^{\beta_2}$, such that

$$U^{vol} = \mathcal{Z} * y + D_M * U_{memb} \tag{3.13}$$

It is now easy to see that the individual will decide to be a church member, $D_M = 1$, if $U_{memb} \geq 0$, and not to be a member if the individual has disutility from membership, $U_{memb} < 0$, e.g. when the individual disagrees with church teachings or behavior. The utility of an individual under a voluntary contributions system, which serves as a benchmark for the tax-based systems, can be summarized as

$$U^{bench} = \begin{cases} \mathcal{Z} * y, & U_{memb} < 0 \\ \mathcal{Z} * y + U_{memb}, & U_{memb} \geq 0 \end{cases} \tag{3.14}$$

3.4 The church tax system

I now incorporate the most important features of the German church tax system into the model outlined in Section 3.2. There are two main differences with respect to the US. First, taxes for financing religious organizations do exist, i.e. D^{rel} can take on the value one.[42] Second, the church membership decision is not independent from the decision on religious contributions. In fact, being a church member entails the duty to pay church taxes, such that $D^{rel} = D_M$. As was laid out above, when individuals pay taxes, they are not free to decide about the amount they give or the purposes their money is used for.

In exchange for paying taxes, the individual receives access to certain benefits from church membership, U_{memb}. Since there is no time dimension in the model, it is not necessary to distinguish between afterlife benefits[43] and this-worldly benefits (such as participation in church groups, access to church-run schools and kindergartens and church ceremonies as well as the possibility to be employed by the church). The model would still be valid if the individual did not believe in the existence of an afterlife. U_{memb} also captures how satisfied the individual is with the organization of the religious community and to which degree personal values and religious doctrine coincide.

In sum, effective religious contributions, g_R, include the share of church taxes spent for purposes the individual values, $a\tau y$, and the full amount of additional voluntary contributions, m_R,

$$g_R = D_M * a\tau y + m_R \tag{3.15}$$

[42] As in the voluntary contribution system, D^{sec} is zero by definition, since financing of secular charitable organizations through taxes does not exist in the church tax system.

[43] There is some debate about how church membership is connected to afterlife benefits and what the consequences of church disaffiliation declared in front of state officials will be. Nikolaus Schneider, the head of the Council of the Evangelical Church in Germany (EKD), whose duty is to represent Protestant Christians in the German public discussion, contributed an article to the Protestant monthly journal *"Chrismon"*, in which he claims that it is not possible to live the Christian faith without church membership (Schneider, 2010). The German Bishops' Conference, the assembly of all Catholic German bishops, published a declaration in which it states that church disaffiliation is a schism and will be punished with excommunication (Deutsche Bischofskonferenz, 2006). Feldhoff (1996: 60) argues in the same direction as the German Bishops' Conference. Recently, the German Bishops' Conference has published another decree (Deutsche Bischofskonferenz, 2012) in which it does not officially declare church disaffiliation a schism, but explicitly points out a whole list of rights a church member loses when he or she declares church disaffiliation (see Section 3.6.4.2). The predominant opinion in the scientific discussion on church law is that church disaffiliation declared in front of state officials automatically has consequences for the membership in the church as a spiritual community (Muckel, 2012). However, some authors argue that disaffiliation from the church in its legal form as a corporation under public law *("Körperschaft öffentlichen Rechts")* does not immediately entail consequences for the membership in the religious community (Zapp, 2012).

Since church membership implies the duty to pay church taxes, effective religious giving differs between church members with $D_M = 1$ and non-members with $D_M = 0$.

Secular contributions are completely voluntary and individuals can always choose organizations that support the causes the individual considers most worthy of his or her contributions, therefore $g_S = m_S$.

The resulting utility function of the individual is

$$U^{chur\_tax} = {m_C}^{1-\beta_1-\beta_2} * (D_M * a\tau y + m_R)^{\beta_1} * {m_S}^{\beta_2} + D_M * U_{memb} \tag{3.16}$$

Not surprisingly, church taxes also appear in the budget constraint of the individual

$$y - D_M * \tau y = m_C + m_R + m_S \tag{3.17}$$

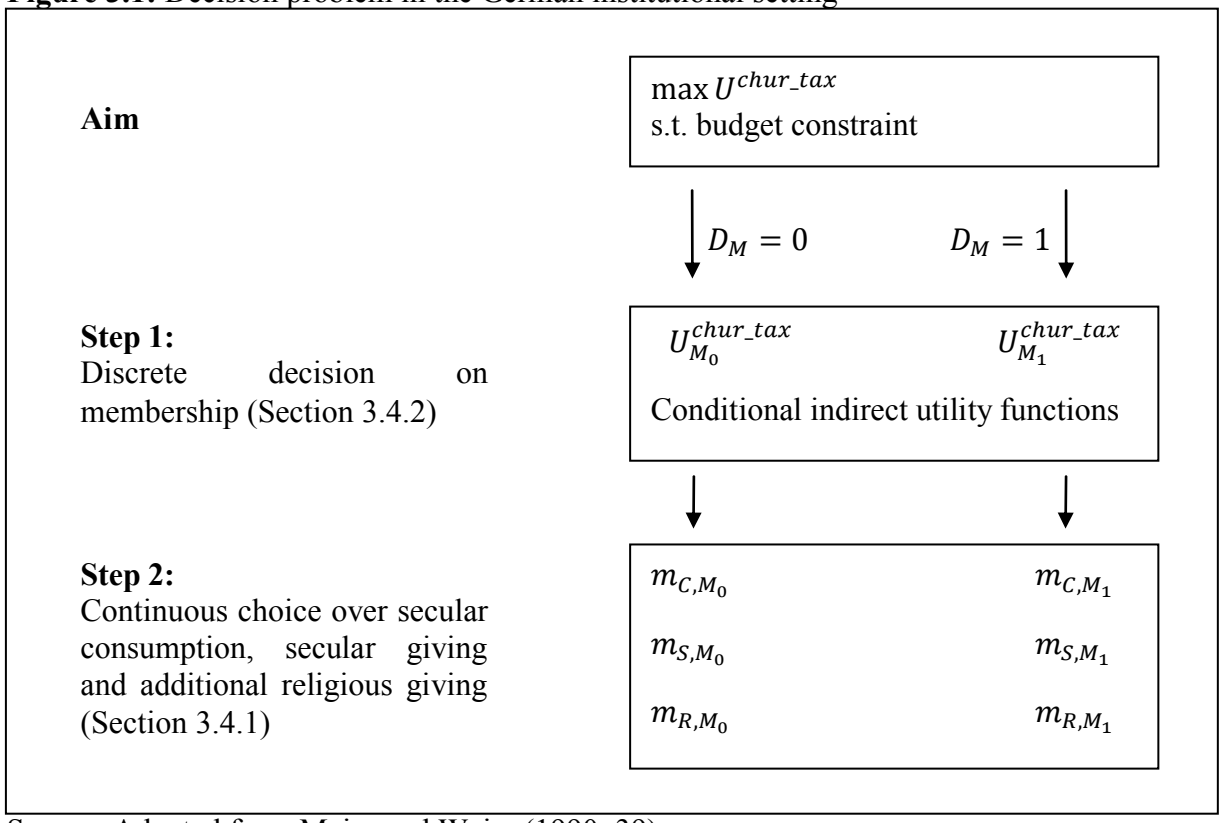
The resulting Lagrangian function is

$$\begin{aligned} & L^{chur\_tax} \\ & = {m_C}^{1-\beta_1-\beta_2} * (D_M * a\tau y + m_R)^{\beta_1} * {m_S}^{\beta_2} + D_M * U_{memb} \\ & + \lambda(m_C + m_R + m_S + D_M * \tau y - y) \end{aligned} \tag{3.18}$$

Secular consumption and voluntary contributions are required to be non-negative, $m_C, m_R, m_S \geq 0$. By comparing the Lagrangian functions of the voluntary contributions case and the church tax case, it becomes obvious that in the church tax system the decisions about church membership and voluntary giving are interrelated, since the church membership indicator D_M appears in both additive parts of the utility function and in the budget constraint. Hence, the solution of the utility maximization problem is slightly more difficult than in the voluntary giving case.

The individual again has four decision variables: D_M, m_R, m_S and m_C. In a church tax system he or she faces a sequential decision structure. After deciding about church membership ($D_M = 0$ or $D_M = 1$) the individual maximizes his or her utility given the respective church membership status by choosing the levels of m_C, m_R and m_S. The decision problem is depicted in Figure 3.1.

Figure 3.1: Decision problem in the German institutional setting



Source: Adapted from Maier and Weiss (1990: 39)

I solve this problem by first specifying the utility-maximizing choices of m_R, m_S and m_C for each discrete value of D_M and then determining the membership alternative that yields the highest utility for the individual.

My model of the German church tax system shares some important features with the model of Borgloh (2012): both models assume a utility function where the individual derives utility from consumption, from voluntary giving and a (positive or negative) additive utility from church membership. In addition, the models share the assumption that the church tax is perceived as a charitable contribution and is a substitute for non-tax charitable giving. The propositions derived from the models refer to the amount given by church members and non-members and the church membership decision. However, there are some important differences. First, while Borgloh (2012) considers only one type of charitable giving, I distinguish between religious and secular giving. Second, Borgloh (2012) assumes that church taxes and donations are perfect substitutes, while they are only imperfect substitutes for religious giving in my own model. Third, in my own model church taxes are a function of income, while they are fixed and independent from income in Borgloh (2012). In the

discussion in Section 3.6.1 and 3.6.2 I will outline how these differences in assumptions affect the model results.

3.4.1 The giving decision

3.4.1.1 The non-membership case

I start with the non-membership case, $D_M = 0$. All variables that refer to this solution are marked with the subscript M_0. Taking the first derivatives of the Lagrangian function and solving for m_C, m_R and m_S yields:

$$m_{C,M_0} = (1 - \beta_1 - \beta_2)y \tag{3.19}$$

$$m_{R,M_0} = g_{R,M_0} = \beta_1 y \tag{3.20}$$

$$m_{S,M_0} = g_{S,M_0} = \beta_2 y \tag{3.21}$$

This corresponds to the benchmark solution (the voluntary contributions case) because non-members do not face any obligatory taxes or any other institutional factors that distort their decision. The similarity to the voluntary contributions case can easily be seen when $D_M = 0$ is inserted in the Lagrangian function (3.18), which leads to cancelling out all taxes. As a consequence, the Cobb-Douglas part of the utility function and the budget constraint are the same as in a voluntary contributions system.

3.4.1.2 The membership case

The situation is different when the individual is a church member, $D_M = 1$. The giving decision of the individual will then depend on the exogenously given tax rate τ and the use of tax revenues by the church, a. Maximizing the utility function subject to the budget constraint and the non-negativity constraints for m_C, m_R and m_S and solving for m_C, m_R and m_S yields:

$$m_{C,M_1} = \begin{cases} (1 - \beta_1 - \beta_2)(1 - (1 - a)\tau)y \leq m_{C,M_0}, & \beta_1 > \dfrac{a\tau}{1 - (1 - a)\tau} \\ (1 - \beta_1 - \beta_2)\dfrac{1 - \tau}{1 - \beta_1}y, & \beta_1 < \dfrac{a\tau}{1 - (1 - a)\tau} \end{cases} \tag{3.22}$$

$$m_{R,M_1} = \begin{cases} \beta_1(1 - (1 - a)\tau)y - a\tau y < m_{R,M_0}, & \beta_1 > \dfrac{a\tau}{1 - (1 - a)\tau} \\ 0, & \beta_1 < \dfrac{a\tau}{1 - (1 - a)\tau} \end{cases} \tag{3.23}$$

$$m_{S,M_1} = \begin{cases} \beta_2(1-(1-a)\tau)y \leq m_{S,M_0}, & \beta_1 > \dfrac{a\tau}{1-(1-a)\tau} \\ \beta_2 \dfrac{1-\tau}{1-\beta_1} y, & \beta_1 < \dfrac{a\tau}{1-(1-a)\tau} \end{cases} \tag{3.24}$$

where the subscript M_1 denotes the solutions in the case $D_M = 1$.

Both regular and corner solutions are possible. The upper expressions in equations (3.22) through (3.24) give the result in the regular solution and the lower expressions the result in the corner solution. Corner solutions occur when the individual's optimal level of voluntary religious giving is negative, which is not feasible. In that case m_{R,M_1} is at its lower bound zero, as can be seen from equation (3.23). I discuss first the regular solution and continue with the results for the corner solution.

In the regular solution with $m_{R,M_1} > 0$ effective religious and secular giving levels are

$$g_{R,M_1} = a\tau y + m_{R,M_1} = \beta_1(1-(1-a)\tau)y \leq g_{R,M_0} \tag{3.25}$$

$$g_{S,M_1} = m_{S,M_1} = \beta_2(1-(1-a)\tau)y \leq g_{S,M_0} \tag{3.26}$$

Both non-tax giving $m_{R,M_1}$and $m_{S,M_1}$and effective charitable giving g_{R,M_1} and g_{S,M_1} are lower than in the benchmark case. Only if $a = 1$, i.e. the tax money is used exactly in the way the individual prefers, the effective giving levels of the benchmark solution can be reached. The reason for the reduction in additional giving is that with $a < 1$, some part of the church tax paid is used for purposes that do not generate any utility for the individual. From the point of view of the individual, this corresponds to a reduction in income. This can easily be seen if one compares the results for effective giving in equations (3.25) and (3.26) to the benchmark outcome in (3.20) and (3.21). Effective giving of church members is multiplied with the factor $(1-(1-a)\tau)$ in comparison to the benchmark. The factor denotes the share of income that the individual can use in line with his or her preferences, i.e. one minus the share of income paid as church taxes and directed to purposes which the individual does not support.

Total revenues of all charities, religious and secular, are

$$m_{R,M_1} + m_{S,M_1} + \tau y = (\beta_1 + \beta_2)y + (1-\beta_1-\beta_2)(1-a)\tau y \tag{3.27}$$

This is larger than in the benchmark case for all $a < 1$. Although additional voluntary giving is smaller than in the benchmark case, the sum of church taxes paid and additional giving is greater and reaches its maximum when $a = 0$. While a reduction in a is comparable to a reduction in income, at the same time it ensures that individuals do not cut their voluntary contributions by the same amount that church taxes increase. This is because paying taxes is not a perfect substitute for non-tax voluntary giving when $a < 1$. When $a = 1$, total giving reaches its minimum. In that case the individual can simply adjust his or her additional religious giving m_{R,M_1} such that he or she is back in the benchmark solution without church taxes.

I now turn to the corner solution where voluntary religious giving m_{R,M_1} is zero. There are feasible values for β_1, a and τ for which the preferred level of voluntary religious giving of the individual is negative. In such cases the non-negativity constraint for m_{R,M_1} is binding. The critical value for β_1 can be calculated by setting the regular solution for m_{R,M_1} in the upper part of equation (3.23) to zero. The result is

$$\widehat{\beta_1} = \frac{a\tau}{1-(1-a)\tau} \leq \tau \tag{3.28}$$

For β_1 below (above) this critical level $\widehat{\beta_1}$, voluntary religious giving is zero (greater than zero). This critical value increases in a and reaches its maximum, τ, when $a = 1$, i.e. the higher is the accordance with the use of money by the church, the less likely it is that individual makes additional voluntary contributions. In any case, the corner solution requires that the church tax rate τ is higher than β_1, which corresponds to the share of income that is voluntarily given to the church in the benchmark case. If β_1 is below its critical level, the amount of church taxes that have to be paid exceeds the utility-maximizing amount of charitable contributions to religious organizations. Consequently, the individual will only pay taxes and will refrain from giving an additional amount m_{R,M_1}.

If β_1 is below the threshold level and $m_{R,M_1} = 0$, voluntary secular giving will also be affected (see equation (3.24)). Secular giving in the corner solution is smaller than in the benchmark and even smaller than in the regular solution, $m_{S,M_1}^{corner} < m_{S,M_1}^{regular} \leq m_S^{bench}$. The reason is that individuals try to off-set some of their higher than optimal spending on religion with cuts in secular voluntary charitable giving.

Total revenues of all charitable organizations, religious and secular, are

$$m_{R,M_1}^{corner} + m_{S,M_1}^{corner} + \tau y = \left[\beta_2 \frac{1-\tau}{1-\beta_1} + \tau\right] y \tag{3.29}$$

which is again higher than in the benchmark case. Although a higher than optimal church tax rate and/or a low fitting parameter induce individuals to reduce their voluntary giving, the overall giving level will rise.

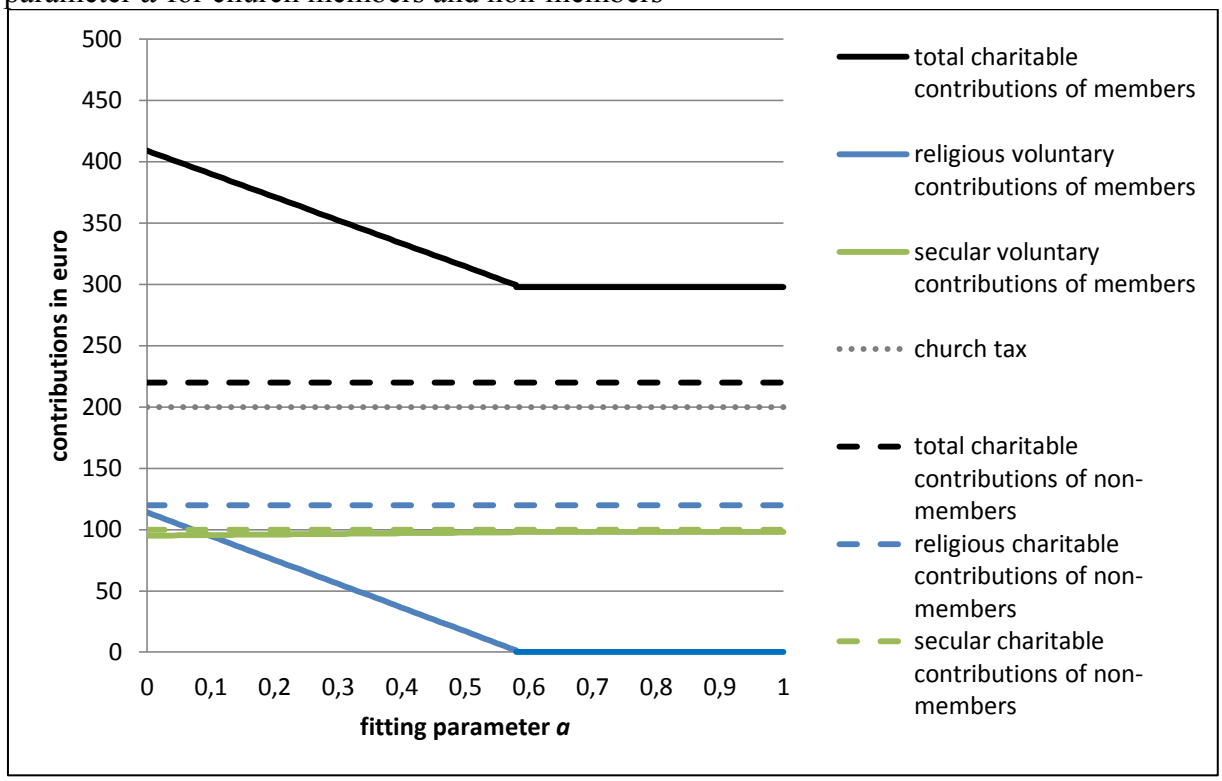
This shows that church members always have a higher total giving, i.e. the sum of church taxes paid and additional voluntary giving, than non-members, except when the fitting parameter a is one. However, when only non-tax giving is considered, one would expect non-members to be more generous, both to religious and secular charities.

The discussion also shows that churches have two major instruments to increase their revenues in comparison to the benchmark. First, they can increase church tax rates, which raises their tax revenues, but will not decrease voluntary contributions by the same amount as long as $a < 1$; alternatively, they can lower the fitting with the preferences of the members by spending revenues on purposes that do not correspond to the preferences of their members and hope for increased voluntary contributions which will then be earmarked to the purposes that matter most to the members. Whichever way a church chooses, it will probably lower revenues of secular charitable organizations, which are exclusively dependent on voluntary contributions. The only action taken by churches that will not affect secular charities is an increase in the church tax rate under the conditions that the church tax rate stays below the critical level $\widehat{\beta_1}$ and the fitting parameter a is one.

The mechanisms described in this section can be seen in Figure 3.2 and Figure 3.3. Figure 3.2 shows total, religious and secular contributions for church members (solid lines) and non-members (dashed lines) and the amount of church taxes that church members have to pay (dotted line) as a function of the fitting parameter a. In order to calibrate the model, the following parameter values were chosen: income y is 4,000 euro; church tax rate τ is 0.05; and Cobb-Douglas parameters β_1 and β_2 are 0.03 and 0.025, respectively.

The first point to notice is that all contributions of non-members stay constant since they are not affected by the fitting parameter of the church. The specific values are 120 euro of religious voluntary contributions m_{R,M_0}, 100 euro of secular contributions m_{S,M_0} and 220 euro of total contributions.

Figure 3.2: Religious, secular, and total charitable contributions as a function of the fitting parameter a for church members and non-members



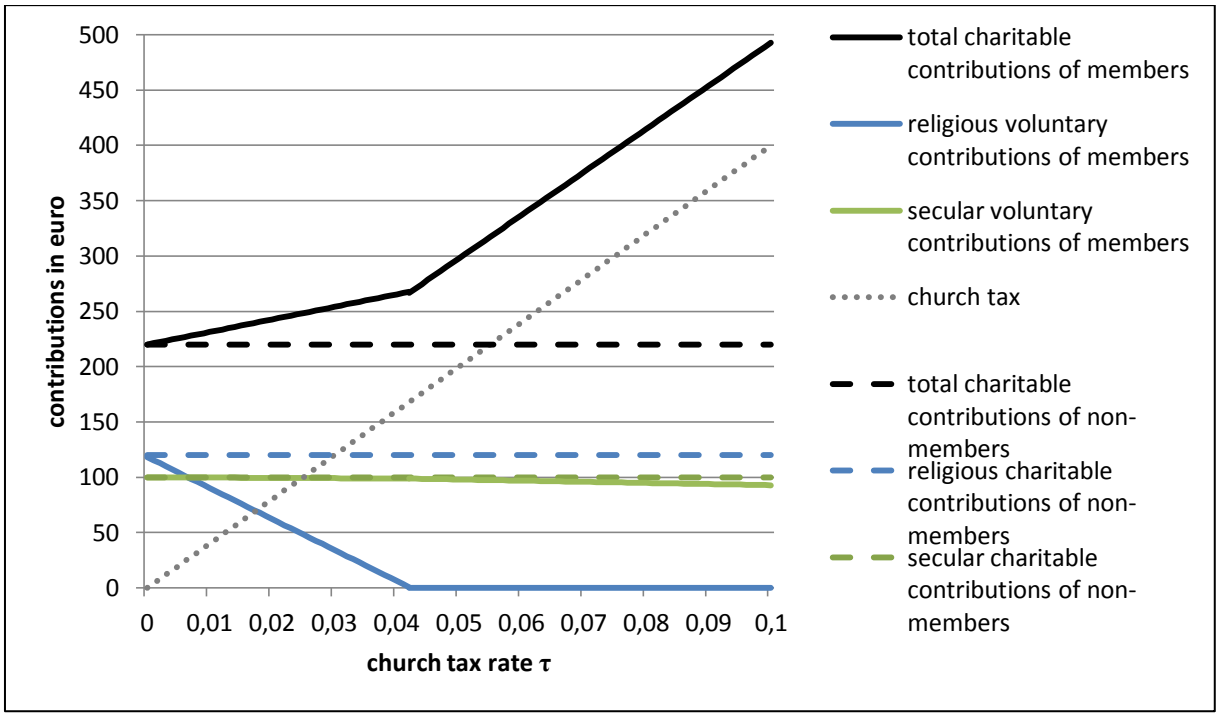
When looking at the contributions of members (solid lines) there is a sharp bend between the values 0.5 and 0.6 of the fitting parameter a. This bend indicates the threshold between the regular and the corner solution. The values left of 0.588 belong to the regular solution. It can be seen that the highest religious voluntary contributions and the highest total charitable contributions (consisting of religious and secular voluntary contributions as well as church taxes) can be achieved when the fitting is lowest, at $a = 0$. The more the individual agrees to the use of tax revenues by the church (a increases), the lower are religious and total contributions. At the same time secular contributions are lowest when the fitting parameter is zero and increase moderately as a grows, but not enough to counterbalance the drop in religious contributions.

After the threshold value for a is reached, religious and secular contributions stay constant. Religious voluntary contributions are zero, secular voluntary contributions are below their non-membership values. Nevertheless, adding up both types of voluntary contributions and church taxes, total contributions are above the non-membership level.

In sum, the church tax does increase total contributions to charitable organizations, but it can significantly crowd out voluntary contributions. The crowding-out is strongest when church taxes and religious voluntary contributions are perfect substitutes.

Figure 3.3 is quite similar to Figure 3.2, only that the fitting parameter a is now fixed at 0.7 and the contributions are shown as a function of the church tax rate τ in the range of 0 to 0.1. Although this does not cover the full range of possible church tax rates, it does cover the typical range of church taxes in Germany, which make up between 2 and 3 percent of income, and reaches up to 10 percent, which corresponds to the literal meaning of "tithing" and is usually considered a generous contribution.

Figure 3.3: Religious, secular, and total charitable contributions as a function of the church tax rate τ for church members and non-members



The contributions of non-members (dashed lines) are the same as in the example underlying Figure 3.2 and they remain constant since they do not depend on the church tax rate. Contributions of members (solid lines) again show a sharp bend, signifying the threshold value between the regular and the corner solution, which is between church tax rates of 4 and 5 percent in the example. The graph clearly shows that an increase in the church tax rate leads to an increase in total contributions of church members (solid black line). However, this increase is completely driven by rising church taxes, while both types of voluntary contributions drop. Religious voluntary contributions decrease until they reach zero and remain there in the corner solution. Secular voluntary contributions decrease only moderately in the regular solution. However, when the individual is not able anymore to cut religious

voluntary contributions because they have already reached zero, individuals cut their secular contributions even faster.

The two graphs show that churches have two possibilities to increase total charitable contributions: increase church tax rates or spend the money for purposes that do not matter much to the taxpayer. However, this always results in a crowding-out of secular contributions. Overall revenues of the church increase in both cases, but increasing the tax rate leads to higher tax revenues that the church can use according to its own ideas, while lowering the fitting with the preferences of the individual increases earmarked non-tax contributions. Furthermore, the numerical examples do not take into account that such decisions by religious communities might also affect church membership decisions. This will be considered in the next section.

3.4.2 The church membership decision

The aim of this section is to determine which factors influence the church membership decision in a church tax system.

This can be done by comparing the utility levels reached by church members and non-members, assuming that the alternative that yields the higher utility will be chosen. The individual faces a trade-off: as a church member he or she needs to pay church taxes that might distort the optimal choice of voluntary religious and secular giving, but in turn receives the additional utility from church membership, U_{memb}. As a non-member he or she avoids the distortions in the giving decision but at the same time renounces the possible membership benefits.

3.4.2.1 The non-membership case

For non-members, $D_M = 0$, the maximum utility can be calculated by plugging the optimal choices for m_{C,M_0}, m_{R,M_0} and m_{S,M_0} from equations (3.19) to (3.21) into the utility function (3.16). The result is the conditional indirect utility function

$$U_{M_0}^{chur\_tax} = (1-\beta_1-\beta_2)^{1-\beta_1-\beta_2} * {\beta_1}^{\beta_1} * {\beta_2}^{\beta_2} * y = \mathcal{Z} * y \qquad (3.30)$$

Not surprisingly, this corresponds to the utility level of non-members in the benchmark solution (3.14). This utility now needs to be compared to the utility of church members, $D_M = 1$. Here it is again necessary to distinguish between regular and corner solutions.

3.4.2.2 The membership case

Starting with the regular solution $\beta_1 > \frac{a\tau}{1-(1-a)\tau}$, the utility can be calculated by inserting (3.22) to (3.24) into the utility function. The result is

$$\begin{aligned} & U_{M_1,regular}^{chur\_tax} \\ & = (1-\beta_1-\beta_2)^{1-\beta_1-\beta_2} * {\beta_1}^{\beta_1} * {\beta_2}^{\beta_2} * [1-(1-a)\tau] * y + U_{memb} \\ & = [1-(1-a)\tau] * \mathcal{Z} * y + U_{memb} \end{aligned} \tag{3.31}$$

(3.31) differs from (3.30) in two important details. First, in order to arrive at the utility of members, the utility of non-members is multiplied with the factor $[1-(1-a)\tau]$, which is smaller than one for all $a < 1$. Second, U_{memb} is added to the utility of members.

If $a = 1$, the distortion captured in the factor $[1-(1-a)\tau]$ disappears. Consequently, the individual will be a church member as long as membership does not entail any disutility, i.e. whenever $U_{memb} \geq 0$. Individuals can realize their optimal level of giving, even if they are church members. In addition, church membership provides additional benefits, captured in U_{memb}. If membership is seen as providing disutility for the individual, $U_{memb} < 0$, he or she will not be a member.

If $a < 1$, the individual will weigh the distortions in his or her giving decision against the benefits of membership and the final decision depends on the specific values of all exogenously given variables. Again, if the utility of membership is negative, the individual will decide against membership. However, even if being a church member entails small or moderate benefits, those might be more than outweighed by the distortions in the giving decision caused by a low fitting parameter a.

Turning now to the corner solution with $\beta_1 \leq \frac{a\tau}{1-(1-a)\tau}$ and plugging in $m_{R,M_1}^{corner} = 0$ and m_{S,M_1}^{corner} from equation (3.24) in the utility function yields:

$$U_{M_1,corner}^{chur\_tax} = (1-\beta_1-\beta_2)^{1-\beta_1-\beta_2} * (a\tau)^{\beta_1} * {\beta_2}^{\beta_2} * \left(\frac{1-\tau}{1-\beta_1}\right)^{1-\beta_1} * y + U_{memb} \tag{3.32}$$

Similarly to the regular solution, the utility derived from the Cobb-Douglas part of (3.32) is lower than the utility in the non-membership case because distorting taxation is again present. However, this utility loss might be counterbalanced if the utility from being a church member is positive and large enough. As before, the decision for or against church membership

depends on how large the wedge is between the preferred level of church contributions and the prescribed church taxes on the one hand, and the extent of the benefits from membership on the other hand.

From equations (3.31) and (3.32) it can be seen that some individuals are church members, while others are not, even when churches provide benefits for their members. I now rearrange the utility levels such that a critical level of income for which the individual is indifferent between being and not being a church member can be calculated. In order to do so, one has to equate the utility in the case of membership and the case of non-membership and then solve for y. Starting again with the regular solution, the result is:

$$y^*_{regular} = \frac{U_{memb}}{(1-\beta_1-\beta_2)^{1-\beta_1-\beta_2} * {\beta_1}^{\beta_1} * {\beta_2}^{\beta_2} * (1-a)\tau} = \frac{U_{memb}}{\mathcal{Z} * (1-a)\tau} \qquad (3.33)$$

Calculating the critical income y^*_{corner} for corner solutions yields

$$y^*_{corner} = \frac{U_{memb}}{(1-\beta_1-\beta_2)^{1-\beta_1-\beta_2} * {\beta_2}^{\beta_2} * \left[{\beta_1}^{\beta_1} - \left(\frac{1-\tau}{1-\beta_1}\right)^{1-\beta_1} * (a\tau)^{\beta_1}\right]} \qquad (3.34)$$

For income above the critical level y^*, the individual is expected to disaffiliate from the church, for lower income, he or she remains a church member. Since the critical level of y^* is negative when $U_{memb} < 0$, the condition for leaving the church is always fulfilled for individuals who perceive church membership as a disutility.

It is also easy to see why the decision to leave the church depends on income. As can be observed from the utility of non-members in equation (3.30) the marginal utility of income is constant for the specific utility function chosen. When comparing the utility of non-members and the utility in the regular solution for members (3.31), one can see that there is a wedge in the Cobb-Douglas part of the utility which is equal to $(1-a)\tau * \mathcal{Z} * y$. This wedge grows linearly in income, i.e. for each additional euro of income the utility is decreased further by $(1-a)\tau * \mathcal{Z}$ in comparison to a non-member with the same income. While the wedge in utility in the Cobb-Douglas part of the utility function becomes wider as income increases, the utility of membership U_{memb} is constant and independent from income. Therefore the loss in utility caused by the duty to pay church taxes that are too high or not used in line with individuals' preferences will at a certain point exceed the benefits of membership.

The most important properties of the critical income level y^*, which apply to both the regular and the corner solution, are $\frac{\partial y^*}{\partial U_{memb}} > 0$, i.e. an increase in the benefits of church membership increases the income threshold for disaffiliation, $\frac{\partial y^*}{\partial \tau} < 0$, i.e. an increase in the church tax rate lowers the threshold level, and $\frac{\partial y^*}{\partial a} > 0$, i.e the lower is the fitting parameter, the lower is the critical income. Also note that in the regular solution, when the fitting parameter a approaches one, the critical income level approaches infinity. This is because with $a = 1$ church taxes and religious voluntary giving are perfect substitutes and the individual does not suffer from a loss in utility when church membership becomes more expensive (up to the point where he or she enters the corner solution).

3.5 The tax assignment system

In what follows, I incorporate a version of the tax assignment system that closely follows the Italian system of *"otto per mille"* into the theoretical model.[44] It is similar to the church tax system in the sense that taxes for religious causes exist. The main difference is that individuals do not decide whether they pay these taxes or not, but who is the beneficiary: either some religious organization or the state. This decision has no implications for receiving benefits from church membership. As a consequence, D^{rel}, D^{sec} and D_M all exist separately. However, the individual can only decide whether he or she gives the tax to a religious community or the state, therefore $D^{sec} = 1 - D^{rel}$. By incorporating these features into the basic model, I get the following utility function

$$U^{ass\_tax} = {m_C}^{1-\beta_1-\beta_2} * (D^{rel} * a\tau y + m_R)^{\beta_1} * \left((1 - D^{rel}) * b\tau y + m_S\right)^{\beta_2} + D_M * U_{memb} \quad (3.35)$$

and the budget constraint

$$y - \tau y = m_C + m_R + m_S \quad (3.36)$$

The individual has five decision variables: D_M, D^{rel}, m_C, m_R and m_S. D_M, the decision to be a church member, and D^{rel}, the decision about the beneficiary of the tax, are again binary variables, taking on the values 0 and 1. As in the discussion of the church tax system, secular consumption and voluntary charitable contributions must not be negative, $m_C, m_R, m_S \geq 0$. Again I assume that not all the charitable contributions through taxes are used in the way preferred by the individual. In this respect, $a, 0 \leq a \leq 1$, denotes the share of revenues of the church that are used in accordance with the individual's preferences, while $b, 0 \leq b \leq 1$, measures the same concept for the state as receiver of the tax. The individual is free to make additional contributions to both religious organizations and secular charities, such that effective religious giving is

$$g_R = D^{rel} * a\tau y + m_R \quad (3.37)$$

and effective secular giving is

[44] In contrast to the actual implementation of the tax assignment system in Italy, I assume that the taxpayer decides about the amount of assignment tax that he or she pays. In reality, the vote of each taxpayer about the use of the tax revenues has the same weight, i.e. each taxpayer decides about the use of an amount equal to the average tax amount.

$$g_S = (1 - D^{rel}) * b\tau y + m_S. \tag{3.38}$$

I solve the decision problem of the individual in three steps. First, I identify the utility-maximizing values for m_C, m_R and m_S for each discrete value of D^{rel}. Second, I determine the decision on the destination of the tax amount, D^{rel}, and third, I describe the church membership decision.

3.5.1 The optimal amount of voluntary giving

Trying to find the optimal amounts of the three inputs m_C, m_R and m_S, it will soon become clear that corner solutions are possible, just as in the church tax system. I start with the assumption that there is a regular solution and then turn to the corner solutions.

If the individual decides to assign his or her tax to a religious community, $D^{rel} = 1$, then maximizing the utility function (3.35) subject to the budget constraint (3.36) with respect to m_C, m_R and m_S yields

$$m_{R,rel} = \beta_1(1 - (1 - a)\tau)y - a\tau y \tag{3.39}$$

The subscript rel denotes the case when the tax is assigned to the church. If $m_{R,rel}$ in (3.39) is non-negative, the corresponding secular contributions are

$$m_{S,rel} = \beta_2(1 - (1 - a)\tau)y \tag{3.40}$$

and total charitable contributions are

$$m_{R,rel} + m_{S,rel} + \tau y = (\beta_1 + \beta_2)y + (1 - \beta_1 - \beta_2)(1 - a)\tau y \tag{3.41}$$

These results are exactly the same as for church members in the church tax system (see equations (3.23), (3.24) and (3.27)). Again it turns out that voluntary secular giving and additional religious voluntary giving are lower, but total giving is higher than in the benchmark case if $a < 1$ and equal to the benchmark if $a = 1$.

If people decide that their tax money should benefit the state, $D^{rel} = 0$, their secular giving is

$$m_{S,sec} = \beta_2(1 - (1 - b)\tau)y - b\tau y \tag{3.42}$$

The subscript sec denotes the case when the tax is assigned to the state for secular purposes. As long as there is no corner solution, i.e. $m_{S,sec}$ in (3.42) is larger than or equal to zero, religious voluntary contributions are

$$m_{R,sec} = \beta_1(1-(1-b)\tau)y \tag{3.43}$$

and total charitable contributions (including taxes) are

$$m_{R,sec} + m_{S,sec} + \tau y = (\beta_1 + \beta_2)y + (1-\beta_1-\beta_2)(1-b)\tau y \tag{3.44}$$

Both religious and secular additional voluntary giving are smaller than in the benchmark case, but total giving (including the assignment tax) is higher than in the benchmark for $b < 1$. The structure of the results equals that for $D^{rel} = 1$. This can easily be seen when comparing the total giving of those who assign their tax to the church (equation (3.41)) and those who give it to the state (equation (3.44)). The fitting parameter with respect to the church, a, in (3.41) is simply replaced by the fitting parameter with respect to the state, b, in order to arrive at (3.44). The same logic applies to the amount of secular consumption, which is the residual spending after subtracting taxes and voluntary contributions from income:

$$m_C = (1-\beta_1-\beta_2)(1-(1-e)\tau)y \tag{3.45}$$

with

$$e = \begin{cases} a, & D^{rel} = 1 \\ b, & D^{rel} = 0 \end{cases} \tag{3.46}$$

From examining the amount of voluntary contributions in (3.39) and (3.42) it is obvious that corner solutions are possible both when the individual assigns his or her taxes to the church and when he or she assigns them to the state. This is because religious as well as secular non-tax giving is restricted to be non-negative.

Corner solutions emerge when one of the following set of conditions is fulfilled:

$$\beta_1 < \frac{a\tau}{1-(1-a)\tau} \leq \tau \text{ and } D^{rel} = 1 \tag{3.47}$$

$$\beta_2 < \frac{b\tau}{1-(1-b)\tau} \leq \tau \text{ and } D^{rel} = 0 \tag{3.48}$$

When the inequality in (3.47) is fulfilled, and the individual chooses to assign his or her tax to a religious community, $D^{rel} = 1$, then the following corner solution emerges:

$$m_{R,rel} = 0 \tag{3.49}$$

$$m_{S,rel} = \beta_2 \frac{1-\tau}{1-\beta_1} y \tag{3.50}$$

Similarly, when the inequality in (3.48) is fulfilled and the individual gives his or her tax to the state, $D^{rel} = 0$, the resulting corner solution is:

$$m_{S,sec} = 0 \tag{3.51}$$

$$m_{R,sec} = \beta_1 \frac{1-\tau}{1-\beta_2} y \tag{3.52}$$

In both cases religious and secular voluntary giving are lower than in the benchmark.

It should also be noted that when only one of the two sets of conditions in (3.47) and (3.48) is fulfilled, the taxpayer has the possibility to assign his or her tax to the other institution and avoid the corner solution. However, as will be shown in the next section, choosing the regular over the corner solution is not always the optimal decision. If both sets of conditions are fulfilled, one of the two corner solutions outlined above must be chosen.

3.5.2 The assignment of the tax to a recipient

The second step of the decision process is the selection of the recipient of the tax. The individual chooses the alternative that offers the highest utility. In order to calculate the utility level, I insert the optimal amounts of consumption and religious and secular giving that were calculated in the previous step into the utility function (3.35). I start again with the regular solution (no binding restriction) and go on to examine each of the possible corner solutions in turn.

3.5.2.1 No binding restrictions

If none of the restrictions concerning m_R and m_S is binding, the utility of the taxpayer is

$$\begin{aligned} & U_{regular}^{ass\_tax} \\ & = (1-\beta_1-\beta_2)^{1-\beta_1-\beta_2} * {\beta_1}^{\beta_1} * {\beta_2}^{\beta_2} * [1-(1-e)\tau] * y + D_M * U_{memb} \\ & = [1-(1-e)\tau] * \mathcal{Z} * y + D_M * U_{memb} \end{aligned} \tag{3.53}$$

with

$$e = \begin{cases} a, & D^{rel} = 1 \\ b, & D^{rel} = 0 \end{cases} \tag{3.54}$$

Contrasting this utility level with the benchmark utility (3.14), the factor $[1-(1-e)\tau]$ in the first summand of (3.53) is added. Utility strictly grows in e. If either e equals one, the factor disappears and the same amount of utility from charitable giving and secular consumption as in the benchmark can be reached.

In order to decide about D^{rel}, the individual compares the utility level $U_{regular}^{ass\_tax}$ for $e=a$ and $e=b$. The two utility levels differ only in the factors $[1-(1-a)\tau]$ and $[1-(1-b)\tau]$, respectively. From examining (3.53) it is clear that $D^{rel}=1$ ($D^{rel}=0$) is chosen if $a>$ $(<)b$. In other words, the individual chooses the alternative that best fits his or her own preferences. If a and b are equal, the individual is indifferent between the choice options. Parameters determining the marginal utility of the commodities, β_1 and β_2, do not play a role in the regular solution because by assumption distortions in the amount given are only caused by the perceived lack of fitting captured in a and b, not by the amount of taxes paid (which are below the amount the individual would give in the benchmark).

The individual chooses the alternative which is closest to the benchmark solution in terms of charitable contributions made and total utility, given the fitting parameters a and b. The chosen alternative is the one which minimizes total charitable contributions. This can easily be seen when comparing (3.41) and (3.44).

3.5.2.2 One binding restriction

If only restriction (3.47) concerning the Cobb-Douglas parameter with respect to religious giving, β_1, is binding and the individual decides to attribute his or her tax to the church, $D^{rel}=1$, the resulting level of utility is

$$U_{rel,corner}^{ass\_tax} = (1-\beta_1-\beta_2)^{1-\beta_1-\beta_2} * (a\tau)^{\beta_1} * {\beta_2}^{\beta_2} * \left(\frac{1-\tau}{1-\beta_1}\right)^{1-\beta_1} * y + D_M * U_{memb} \tag{3.55}$$

Since both religious and secular non-tax giving are distorted in comparison to the benchmark, the individual arrives at a utility from charitable giving and secular consumption that is lower than in the benchmark case. If the individual instead decides to attribute his or her taxes to the state, the utility level of the regular solution (3.53) with $D^{rel}=0$ is achieved.

In order to determine the assignment choice of the individual, one has to compare the utility from giving to the church in (3.55) to the utility from giving to the state in (3.53).

In order to choose the secular alternative, the following inequality must be fulfilled:

$$\left[\frac{\beta_1(1-\tau)}{\tau(1-\beta_1)}\right]^{\beta_1} * \left[\frac{(1-(1-b)\tau)*(1-\beta_1)}{1-\tau}\right] < a^{\beta_1} \tag{3.56}$$

There are feasible values for a, b, τ and β_1 for which this inequality and the conditions for a corner solution in (3.47) are fulfilled and others for which they are not. In other words, both the corner solution and the regular solution can be optimal. In general, a low value of a, i.e. a low accordance between the use of funds by the church and the individual's preferences will induce the individual to assign his or her money to the state. In a similar fashion, a high value of b will also make it more likely that the state is chosen as the receiver of the taxes. The marginal utility of secular giving, which manifests itself in β_2, is of no importance.[45] In contrast, the marginal utility of giving to religion, β_1, does matter. The lower β_1, the more likely it is that the individual chooses the state. The income has no influence on the decision.

The total amount of giving is

$$\begin{aligned} & m_R + m_S + \tau y \\ & = \begin{cases} (\beta_1+\beta_2)y + (1-\beta_1-\beta_2)(1-b)\tau y, & U_{rel,corner}^{ass\_tax} < U_{sec,regular}^{ass\_tax} \\ \left[\beta_2 \dfrac{1-\tau}{1-\beta_1} + \tau\right] y \quad , & U_{rel,corner}^{ass\_tax} > U_{sec,regular}^{ass\_tax} \end{cases} \end{aligned} \tag{3.57}$$

In contrast to the regular solution above, the chosen alternative is not necessarily the one that implies the lower amount of total giving.

Now I turn to the case where restriction (3.48) on β_2, the marginal utility of secular giving, is binding and the individual decides to attribute his or her taxes to the state, $D^{rel} = 0$. The resulting utility is

$$\begin{aligned} & U_{sec,corner}^{ass\_tax} \\ & = (1-\beta_1-\beta_2)^{1-\beta_1-\beta_2} * {\beta_1}^{\beta_1} * (b\tau)^{\beta_2} * \left(\frac{1-\tau}{1-\beta_2}\right)^{1-\beta_2} * y + D_M * U_{memb} \end{aligned} \tag{3.58}$$

In order to see whether the individual chooses the corner or the regular solution, this utility level must be compared to utility in the unrestricted case (3.53) with $D^{rel} = 1$. The resulting

[45] There is one exception: an increase in b will c.p. lead to an increase in the threshold level for β_2. If the threshold is surpassed, β_2 starts to matter, as can be seen below in (3.61).

condition for the individual to choose the religious community as the receiver of the assignment tax is

$$\left[\frac{\beta_2(1-\tau)}{\tau(1-\beta_2)}\right]^{\beta_2} * \left[\frac{(1-(1-a)\tau) * (1-\beta_2)}{1-\tau}\right] < b^{\beta_2} \tag{3.59}$$

The total amount of giving is

$$m_R + m_S + \tau y = \begin{cases} (\beta_1 + \beta_2)y + (1-\beta_1-\beta_2)(1-a)\tau y, & U_{sec,corner}^{ass\_tax} < U_{rel,regular}^{ass\_tax} \\ \left[\beta_1 \frac{1-\tau}{1-\beta_2} + \tau\right] y \quad , & U_{sec,corner}^{ass\_tax} > U_{rel,regular}^{ass\_tax} \end{cases} \tag{3.60}$$

One can easily see that the condition for choosing one of the alternatives and the total amount of giving for the case with $D^{rel} = 1$ are symmetric to the solution discussed above for $D^{rel} = 0$, i.e. β_1 is replaced by β_2 and a is replaced by b. Under these premises the same discussion as in the case above applies.

3.5.2.3 Two binding restrictions

If the inequalities in (3.47) and (3.48) are both fulfilled for the individual, i.e. he or she always ends up in a corner solution independent of who receives the tax, the two possible outcomes are the two restriction cases discussed in the previous section. Whether the individual attributes the tax to the church or the state can be determined by equating $U_{sec,corner}^{ass\_tax}$ and $U_{rel,corner}^{ass\_tax}$. The result is

$$\begin{gathered} U_{sec,corner}^{ass\_tax} \lesseqgtr U_{rel,corner}^{ass\_tax} \\ \Leftrightarrow b^{\beta_2}\left(\frac{\tau(1-\beta_2)}{\beta_2(1-\tau)}\right)^{\beta_2} * \left(\frac{1}{1-\beta_2}\right) \lesseqgtr a^{\beta_1}\left(\frac{\tau(1-\beta_1)}{\beta_1(1-\tau)}\right)^{\beta_1} * \left(\frac{1}{1-\beta_1}\right) \end{gathered} \tag{3.61}$$

Which of the two alternatives is chosen depends on both the marginal utilities of the two types of giving, β_1 and β_2, and the individual's opinion about the use of revenues by church and state, a and b. If $a = b$, the church (the state) will receive the tax if $\beta_1 > (<)\beta_2$. A decrease in b (a) will *ceteris paribus* increase the chances that the church (the state) receives the funds. One could say that a high marginal utility of religious (secular) giving can be counteracted in the giving decision by the state's (the church's) use of funds for purposes that the individual highly agrees with.

Total giving in the case where both restrictions are binding is

$$m_R + m_S + \tau y = \begin{cases} \left[\beta_1 \frac{1-\tau}{1-\beta_2} + \tau\right] y, & U_{rel,corner}^{ass\_tax} < U_{sec,corner}^{ass\_tax} \\ \left[\beta_2 \frac{1-\tau}{1-\beta_1} + \tau\right] y, & U_{rel,corner}^{ass\_tax} > U_{sec,corner}^{ass\_tax} \end{cases} \quad (3.62)$$

This amount is higher than what the individual gives in the benchmark case without the tax, $(\beta_1 + \beta_2)y$. However, the purpose that is supported by the tax receives a higher amount of money than in the benchmark, while the other cause receives less. As an example, imagine that an individual decides to attribute his or her tax to the church without making any additional voluntary contributions to the church. Total religious contributions equal τy, which is higher than the benchmark contribution level, $\beta_1 y$. However, total contributions to secular causes amount to $\beta_2 \frac{1-\tau}{1-\beta_1} y$, which is less than benchmark contributions $\beta_2 y$.

It should also be noted that choosing the alternative that provides the highest utility for the individual is not equivalent to minimizing total charitable contributions and that the total giving is independent from the fitting parameters of the two alternatives.

Several conclusions can be drawn from the discussion of the tax assignment system. First, if the government chooses a tax rate τ that is sufficiently high, it is possible to increase the overall amount of voluntary contributions. Nevertheless, the government should be aware that if the majority of citizens choose one of the two alternatives – say, the church – the church might end up with more donations than in the benchmark case, while secular purposes might receive even less than the benchmark amount.

Second, low fitting of the use of revenues with the preferences of individuals can also be used to increase the total amount of charitable contributions. Thus, religious organizations and the state can direct their tax revenues to causes that they consider important while expecting that each taxpayer makes some additional voluntary contributions to the causes that matter most to him or her. However, if only the church or the state lowers the fitting with individuals' preferences, while the other institution does not, the institution with the higher fitting parameter will receive the bulk of the tax revenues. In other words, the tax assignment system encourages competition between church and state for tax revenues. Such competition is centered on the fitting parameters a and b (see Meuthen, 1993: 195 and sources therein).

3.5.3 The church membership decision

The decision about church membership is straightforward. The utility of membership is simply added to the utility from consumption and giving. There is no connection between the

decision on giving and the membership choice, just as in the voluntary giving system. Therefore all individuals with a non-negative utility from membership are church members:

$$D_M = \begin{cases} 0, & U_{memb} < 0 \\ 1, & U_{memb} \geq 0 \end{cases} \tag{3.63}$$

3.6 Discussion

3.6.1 Summary of results for religious and secular contributions

The first set of research questions that this chapter tries to answer is:

Does the institutional framework affect decisions on religious and secular charitable giving? Which are the variables that influence the decision on the amount given and the division of contributions between religious and secular beneficiaries?

The results show that the existence of taxes – church taxes and assignment taxes – can, but need not always, bias the amount of voluntary contributions and the distribution to different causes. Further, the results suggest that taxes – should they have an influence on voluntary contributions – tend to reduce the purely voluntary contributions, but increase total giving, i.e. taxes and additional voluntary giving taken together. Two channels are identified through which church and assignment taxes can increase total giving. First, the compulsory tax amount can be higher than what the individual gives in the benchmark case, i.e. in the absence of a tax system. Second, the individual might agree with the amount of taxes he or she has to pay, but not with how these taxes are used. If the taxpayer has the impression that the causes which are most important to him or her do not benefit enough, he or she might decide to make some additional voluntary contributions.

In the voluntary giving system, the amount given by an individual positively depends on his or her income and the marginal utility of giving to each of the two types of organizations, captured by β_1 and β_2. Since purely voluntary contributions represent the case without any institutional provisions that restrict individuals in their giving choices, I use this system as a benchmark against which I compare the church tax and the tax assignment system.

I find that in the tax systems, some additional variables affect the amount given and how giving is divided between religious and secular causes. First, the use of taxes by the organizations which receive them, captured by a and b; and second, the tax rate τ.

In both tax systems, the benchmark outcome concerning the amount and distribution of contributions can be reached. Some preconditions need to be fulfilled. In the church tax system, one possibility is that the individual disaffiliates from the church and decides freely whether and how much to give. But even as a church member, the benchmark outcome can be reached if the individual fully agrees with the use of funds by the church, $a = 1$. In addition, church taxes must be sufficiently low such that the amount paid as church taxes does not

exceed the amount that would be giving voluntarily, $\beta_1 > \tau$. In that case, the individual completely substitutes his or her own voluntary giving for the church tax and makes additional non-tax contributions until his or her preferred level of giving is reached. Although the amount given and the distribution between religious and secular charities is the same as for non-members, the individual will prefer the membership alternative if his or her benefits from church membership, U_{memb}, are positive.

In the tax assignment system the benchmark solution can also be achieved if at least one of the fitting parameters is one, $a = 1$ and/or $b = 1$. In addition, the tax rate must not exceed the Cobb-Douglas parameter which refers to the type of giving where the fitting is complete: if $a = 1$ ($b = 1$) then it must be true that β_1 (β_2) is greater than or equal to τ. The tax would then be assigned to the organization that is perceived as acting in concordance with own preferences, and additional giving is distributed such that the benchmark solution without a tax system in place is reached.

In the church tax system, giving is distorted in comparison to the voluntary giving system when the individual is a church member and church taxes are too high from the individual's point of view, $\tau > \beta_1$, and/or the fitting with respect to the church is not perfect, $a < 1$. In all these cases, total giving is higher than without the tax system in place. However, when obligatory contributions are too high or not used in accordance with preferences, additional voluntary giving is cut for both religious and secular purposes. Furthermore, the results show that in the regular solution total giving negatively depends on the fitting parameter with respect to the church, a. In the corner solution, individuals do not make any voluntary contributions to the church. Their secular contributions depend on the amount of taxes they have to pay, but not on how these are used by the church.[46]

[46] The results reveal some similarities, but also some differences with Borgloh (2012) who develops the only theoretical model of church taxes and voluntary giving in Germany that I am aware of. Both models find that church taxes lead to a reduction in charitable contributions. This is not surprising because in both cases church taxes and charitable contributions are modeled as substitutes. However, in Borgloh (2012) the crowding-out is complete, while in my model it is not when $a < 1$ because in that case the two types of giving are not perfect substitutes. Borgloh also distinguishes between what I call in my paper "regular" and "corner solutions", i.e. cases when the church member does or does not make additional religious contributions. In Borgloh's paper the distinction is simply between individuals who donate and who do not donate because she models only one type of donation. Both models assert in their findings that a higher church tax (in my own model: church tax rate) increases the probability that individuals are in the corner solution. However, Borgloh also describes a solution where non-members do not make any charitable contributions. Such a state is impossible in my own model because in the utility function which I use the first euro of giving has infinite utility, while Borgloh assumes that the marginal utility of the first euro of giving is finite. If the marginal utility of the first euro of giving is lower than the marginal utility of the last euro of consumption, Borgloh's model predicts non-giving non-members. The additional findings from my own model, which cannot be deducted from Borgloh (2012), are grounded in the fact that in my model church taxes and charitable giving are not perfect substitutes: first, church taxes and

In the tax assignment system, the benchmark is not achieved when the organization that receives the tax (the state or the church) does not act completely in accordance with the preferences of the individual and/or if the tax is higher than what would be optimal for the individual. When tax rates are sufficiently low, such that the tax amount is less than what the individual gives voluntarily, the individual chooses the alternative with the better fitting. However, when tax rates are high, the option with the best fitting might not be the one that maximizes individual utility. Imagine that the fitting parameter with respect to the church is high, but the person hardly receives any utility from religious giving, i.e. β_1 is very low. In such cases the individual might decide to attribute his or her taxes to the state, even though the state uses only a fraction of its revenues on the causes that are important to the individual. In addition, the individual will make a voluntary charitable contribution to a secular cause that is in line with his or her preferences and a (small) religious contribution. The decision who receives the tax is completely independent from the income of the taxpayer.

In both tax systems the field of charitable activity that eventually receives the tax has higher revenues than in the benchmark case, while the other type of organization loses revenues. While in the church tax system it is clear that churches profit and secular organizations lose revenues, it is a priori unclear which organizations profit and which lose with the tax assignment system in place.

3.6.2 Summary of results for church membership

The second set of research questions in this chapter addresses the implications of the church financing system for church membership. In the voluntary contributions and the tax assignment system, giving and church membership are disconnected. The membership decisions solely depend on the utility of membership, U_{memb}. If the individual benefits from being a member, he or she will decide to be a member; if membership induces disutility, the individual decides against membership. Since church membership does not entail any (pecuniary) costs and benefits are disconnected from individual contributions – at least within this model – the model predicts that church membership is independent from the individual's income, the tax rate of the assignment tax and the use of revenues by the church.

In contrast, in the German church tax system church membership and church taxes are tied together. One can expect rational individuals to weigh benefits and costs of membership. The costs are determined by three different variables: the church tax rate, the individual's income

voluntary religious contributions are imperfect substitutes when the fitting parameter is below one, and second, in my model there are secular contributions which are not a substitute for religious contributions or church taxes.

and the fitting parameter with respect to the use of revenues by the church. The model suggests that more people disaffiliate when church tax rates rise; that the disaffiliation rate is higher (i) among high-income individuals because for them the absolute tax burden is higher and (ii) among individuals who do not agree with the priorities and values that determine the use of funds by the church.[47]

The model identifies some key instruments that churches in Germany could consider to retain its membership. Concerning the benefits of church membership, they could

- provide more benefits for members or increase the appreciation of the benefits they offer already;
- rigorously exclude non-members from membership benefits.

Furthermore, churches could increase the fitting parameter a, e.g. by

- spending their revenues in the way the church tax payers prefer;
- informing taxpayers about how funds are used;
- explaining why it is important to use some share of the taxes for less popular activities, e.g. for administration.

Finally, churches should be aware that the tax system is designed in a way that the incentive to disaffiliate is higher for high-income individuals. They could

- make more use of maximum tax rates and tax rebates for one-time high incomes;
- increase the public recognition of the large amount of church taxes paid by high-income individuals.

3.6.3 Welfare implications

Church taxes and assignment taxes are helpful instruments to raise revenues for religious organizations and also to raise contributions to charitable causes in general above their equilibrium level. This can be done by setting the tax rate sufficiently high and by distributing the tax revenues to causes that would otherwise be neglected by donors.

[47] Some of the model results concerning church membership coincide with Borgloh's (2012), while others do not. In both models, individuals who have a disutility from being a church member decide against membership. Borgloh's model predicts that individuals who are in a regular solution (i.e. who make additional charitable contributions) do not disaffiliate when the church tax increases. In my own model, this is only true when $a = 1$, because only then an increase in church taxes can be compensated perfectly by a decrease in charitable giving. A difference between Borgloh's and my own reasoning exists concerning income: while Borgloh claims that individuals with higher income are more likely to be church members, I derive the opposite hypothesis. The reason for this difference is that Borgloh models church taxes are independent from income, while in my model taxes grow with income.

However, within the model framework church taxes and assignment taxes have a negative impact on welfare. Since taxes potentially disturb private decisions on the amount of contributions and the causes they should benefit, the utility of individuals is reduced compared to the benchmark voluntary giving system. Therefore, judging only from the point of view of the representative individual in my model, the welfare-maximizing system is the voluntary contributions system.

However, the model completely neglects that there are usually beneficiaries of the higher than individually optimal contributions in the tax system. The taxes collected can be used for creating private goods for some individuals that are not captured in the model, such as church or state employees who are paid through church and assignment taxes; or children, poor people and other groups of society who benefit from the charitable activities of the church or of secular organizations. Taxes can also be used for producing public goods, such as fighting poverty, nurturing of democratic attitudes or conservation of the cultural heritage. Neither individuals who receive private benefits from the distribution of taxes nor any public goods are part of the model. The reason is that the model is intended to focus on those who pay the taxes. Public goods are not included because they do not change individual decisions when the number of church members (taxpayers) in society is large.

In order to evaluate overall welfare in the church tax system, the utility losses of the church tax payers must be compared to the increase in utility of beneficiaries and the total benefits from public goods created. This is beyond the scope of this model.

In fact, churches in Germany justify the collection of church taxes at least partly with the argument that the money is used to support causes that would otherwise be neglected by donors, e.g. organizations helping children receive more funding than organizations helping homeless people or drug addicts. In the same vein, church members tend to support their local congregations and neglect denominational bodies. If it is true that private donors support a limited amount of "popular" causes, while other causes that have an equally high or even greater impact on society are not supported, and if the church behaves as a benevolent organization that corrects this inefficient distribution, then church taxes can also be justified. Still, it is important to keep in mind that church taxes in Germany bias giving towards higher revenues for churches and lower revenues for secular organizations. Unless there is convincing evidence that the church has an efficiency, knowledge or scale advantage over secular institutions, this bias is difficult to justify. The same reasoning applies with respect to the state as the receiver of taxes in the tax assignment system, but at least the state has a

democratic legitimization for the public goods it provides and the subsidies it concedes, while churches do not.

If one accepts the assumption that voluntary giving is inefficiently low without the tax system in place, then the tax assignment system appears to be the alternative that provides the higher welfare. First, since nobody can escape from the duty to pay taxes in the tax assignment system and free-ride on the contribution of others, the total amount of taxes collected is higher and the tax rate can easily be set at the welfare-maximizing level.[48] Second, since avoiding the tax by disaffiliating from the church is not an option, everybody who has a positive benefit from being a church member can be a member. In the church tax system, some individuals drop out of church even though their membership utility is positive. This can be rational when they weigh the individual costs of membership against the benefits, but might be the wrong decision when social benefits of paying church or assignment taxes are included in the equation. Third, in the church tax system the possible benefit of increasing the level of public goods comes at the cost of giving these goods a religious touch. This is because in the church tax system above-benchmark revenues pertain to the church, while secular charitable organizations even lose revenues. The tax assignment system offers two different choices for the individual (assigning taxes to the state or the church), therefore individuals can decide for the alternative that offers the best combination of subjective importance of the field of giving (captured by β_1 and β_2) and the fitting parameters (captured by a and b). It is a priori unclear in the tax assignment system whether religious or secular institutions receive higher revenues than in the benchmark. It is even possible that both profit at the same time.

Finally, there are some more arguments in favor of a tax system compared to a voluntary contribution system that are outside the scope of the model. A tax system likely reduces transaction costs, because charitable organizations need not spend money on fundraising activities and the maintenance of donor relations. The tax system also mitigates the influence of high-income donors because they are not free to decide how their money is used. The disconnection of the amount given and the distribution of funds is particularly high in Italy where individuals cannot earmark the amount of taxes they personally pay for use by the government or the church. In fact, the total amount of revenues of the *"otto per mille"* is distributed according to the individual decisions, whereby the vote of each single taxpayer has the same weight.

[48] It should be noted that the actual tax rate of the *"otto per mille"* in Italy is much lower than the church tax rate in Germany.

3.6.4 Changes to the church financing systems - common suggestions and recent developments in the light of the model

In order to evaluate suggestions for the future development of church financing systems, some criteria or objectives need to be defined. Without doubt the perfect church financing system differs depending on whom one asks. From the point of view of church tax payers, their individual utility matters. For the beneficiaries of the system, such as churches and secular charities and their clients, the maximization of revenues is important. For the religious communities, maximizing the number of members can also be an aim. These three objectives will be considered for each suggestion.[49]

The following suggestions will be discussed:

- making the tax assignment system more efficient by letting taxpayers decide how their secular contributions are used;
- separating church membership from the duty to pay church taxes in the church tax system;
- switching from the church tax to the tax assignment system.

3.6.4.1 Making the tax assignment system more efficient

Looking at the implementation of the tax assignment system in Italy, one can conclude that until the mid-2000s the government used most of its revenues for the conservation of cultural heritage and neglected the other purposes listed in the law (Pistolesi, 2006: 170). The Italian government even has the possibility to use some of the revenues for non-charitable purposes (Pistolesi, 2006: 175; see also Servizio studi del Senato, 2012: 3-4), which it has used extensively in recent years. For example, in 2011 it was not possible for charitable organizations to get any funding from the state's revenues of the *"otto per mille"* since it was spent exclusively on firefighting planes for the Office of Civil Protection and the renovation of prisons (Governo italiano, 2012). Furthermore, the government does not advertise in order to convince citizens that they should assign their taxes to the state, while churches, in particular the Catholic Church, do. Judging from the actual implementation of the tax assignment system in Italy, it appears as if the government consciously disincentivizes citizens to attribute their taxes to the state, possibly in an attempt to favor religious communities as receivers of the funds.

[49] For the social planner, maximizing social welfare is the objective. Unfortunately, it is impossible to evaluate welfare within the model framework (see Section 3.6.3).

There have been various – unsuccessful – initiatives to extend the scope of charitable purposes supported and to allow financing of municipal governments, scientific research, a foundation for women and families, associations that support the handicapped or large private charities (Carmignani Caridi, 2006: 150-156). This again suggests that citizens are not satisfied with the way the state uses its revenues from the assignment tax, or in the terms of my model, that b is low. As a consequence, more people might attribute their taxes to religious organizations at the possible cost of diminished contributions to secular purposes.

One conclusion from such a strategy by the state is that the state tries to avoid competition between church and state for the revenues of taxpayers. Such competition in fitting parameters is inherent in the tax assignment system (see Meuthen, 1993: 195 and sources therein), but can be avoided if one of the participants consciously uses its revenues in a way that is not in line with taxpayers' preferences.[50]

A possibility to make the Italian tax assignment system more flexible, foster competition and thereby increase the utility of taxpayers is to increase the number of possible choices. The state could also take up previous suggestions and broaden the scope of activities that are supported by tax revenues – if these activities correspond to the preferences of many Italians. This idea could be taken a step further by allowing individuals to name one or more charitable organizations on their tax returns which should receive their taxes. In fact, a similar system exists in Italy. Apart from the assignment tax or *"otto per mille"*, there is a separate regulation which is called *"cinque per mille"* ("five per thousand"). Here taxpayers have the possibility to assign 0.5 % of their income tax amount to various non-profits, local social assistance centers, universities and research institutions that they name on their income tax returns (see http://www.cinquepermille.net/). All these measures increase the variable b in the model.

Furthermore, instead of a binary choice between assigning taxes to the church or the state, individuals could be given the possibility to split taxes between the two destinations. Again, this would adjust the system to the preferences of individuals, because they are no longer forced to make higher than individually efficient contributions to just one of the two

50 The tax assignment system was originally introduced to replace the previous system of state financing of the Catholic Church with a different system. If the state presented itself as a more attractive beneficiary of the tax system than the church, revenues of religious organizations could drop significantly and the target for which the "otto per mille" was created would be missed.

destinations while for the other cause only the possibility to make voluntary contributions remains.

It is easy to see that such measures increase the individual utility for those who want to give at least some of their tax money to the state and leave utility unchanged for those who attribute the whole tax amount to the church.

With the measures discussed above overall charitable giving will decrease, which can easily be seen when one remembers that the drivers of above-benchmark giving in tax systems are the low perceived fitting with respect to the use of revenues by the institutions receiving the tax and higher than individually optimal tax rates. When fitting is increased or taxes can be split up between the causes that one would like to support, these drivers of above-benchmark giving are reduced. If the state unilaterally increases its fitting parameter, it will increase its revenues while the church will lose both taxes and voluntary contributions. When taxes can be split up between churches and the state, it is a priori unclear who profits and who loses. However, in the end aggregate giving will more closely resemble the distribution of β_1 and β_2 in society.

Within the model framework the ideas and suggestions discussed in this section do not have any effect on church membership numbers.

3.6.4.2 Free church membership in the church tax system

In September 2012 the Federal Administrative Court of Germany decided about the legal challenge of a retired professor of church law. He demanded the right to disaffiliate from the church as a corporation under public law *("Körperschaft öffentlichen Rechts")*, which collects church taxes, but at the same time he wanted to remain a member of the Roman Catholic Church as a religious community. The court decided that the professor has the right to state that he only wants to leave the corporation under public law, but that the consequences thereof are a matter of the Church, not of the state. (Schilder, 2012)

Days before the decision by the Federal Administrative Court, the German Bishops' Conference published a decree stating that the declaration of church disaffiliation in front of a state authority is a violation of church members' "obligation to maintain communion with the church" and their "obligation to assist with the needs of the Church so that the Church can fulfil its duties" (Deutsche Bischofskonferenz, 2012 [my own translation]). The decree also lists the consequences of church disaffiliation:

- loss of right to receive sacraments (repentance, Eucharist, confirmation, anointing of the sick)
- loss of right to hold an office in the church
- loss of right to be godfather or sponsor
- loss of right to vote in the church
- loss of right to be in a church council
- loss of right to be a member of a church association
- religious weddings only possible under additional provisions
- religious funeral can be denied
- consequences for church employees according to specific regulations for church employees
- loss of right to work as religious education teacher or as professor of theology.

Both the court's decision and the bishops' decree made it clear that there will be no separation of the duty to pay church taxes and the right to enjoy membership benefits. In the terms of the model, a separation of church tax payments and entitlement to membership benefits would imply a change from the church tax to the voluntary giving system, since the church tax would only be a suggestion for an adequate contribution (such as tithing in parts of US churches). For the model church member, such a change would increase his or her utility since the individual could decide about his or her optimal level of giving without constraints and everybody who has a non-negative utility from membership could be a member.

The model implies that total contributions to the church decrease and their structure changes as well. One would expect to see more voluntary contributions, which are likely to be earmarked, and less church tax revenues, since only those individuals who fully agree with the use of revenues by the church ($a = 1$) would pay church taxes. In contrast, voluntary contributions to secular charities would increase.

Furthermore, there should be an increase in the number of church members, since the costs of church membership are zero in the voluntary giving system, but can be considerable in the church tax system, while membership benefits remain constant.

3.6.4.3 Replacing the church tax system with a tax assignment system

Opponents of the church tax system in Germany often suggest a reform of the church financing system and the introduction of church financing through tax assignment or through

completely voluntary contributions without any state interference (see Branahl, 1992: 34-42; Feldhoff, 1996: 41-48).

Assuming for a moment that the tax rates in the church tax and the tax assignment systems are the same, it is not possible to say which system generates the highest total contributions to charitable causes. In the tax assignment system the state can be a highly attractive alternative to religious giving that allows individuals to fulfil their demand for charitable giving such that additional secular giving will be reduced to a minimum. Consequently, overall giving is lower than in the church tax system where all church members are forced to choose the church as the receiver of the money, and to make additional voluntary contributions if the perceived fitting with respect to the church is low.

However, if the tax rate is sufficiently high or the fitting parameter with respect to the church is low in the church tax system, a significant share of church members, in particular those with a high income, will disaffiliate from the church in an attempt to elude the tax. In that case, the tax assignment system will generate higher revenues. In the church tax system the churches' ability to raise revenues above the level that would be given completely voluntarily critically depends on the benefits that the churches provide. However, in the previous decades social pressure to be a church member has diminished and more secular alternatives to religious groups, religious counselling or religious festivities exist. All these developments diminish the benefits of church membership. At the same time, the number of non-religiously affiliated organizations and charities has increased and it is easier nowadays to find an organization which supports the charitable activities one prefers. As a result, churches face two types of people who drop out: those who turn away from the church completely because they do not feel any benefits of membership and those who want to stay close to the church but prefer to decide independently which church-related projects they support financially.

This leads to the second question how a change from the church tax to the tax assignment system will affect church membership numbers. In the tax assignment system there is no financial incentive to leave the church. All individuals with positive membership benefits are members. Consequently, membership numbers are higher than in the church tax system.

The overall effect on individuals' utility is unclear. For church members who attribute their tax to the church in the tax assignment system, nothing will change.[51] Church members who decide to attribute their money to the state profit since the tax in the assignment system offers

[51] If the tax assignment system induces churches to increase the fitting parameter a, these church members might even profit.

them an alternative that is more attractive to them than giving to the church. Most non-members lose, because they are forced to pay taxes and give them to some organization that they might perceive as not acting in accordance with their preferences. However, there can also be some non-members who profit. Imagine a person has left the church because he or she disagrees with the use of revenues by the church, but still he or she has positive membership utility. Such a person might profit from the introduction of the tax assignment system because it provides the individual with the possibility to be a church member but still attribute the taxes to secular institutions, which might have a better fitting than the church.

3.6.5 Limitations of the model and suggestions for further research

Although the model is quite extensive and helps shed light on some empirical observations, there are still limitations. First, both the church tax and the tax assignment system are represented in a simplified way. In the model, I assume a constant tax rate. In reality, in Germany as well as Italy the church and assignment taxes, respectively, are progressive. Furthermore, these taxes depend on taxable income, which differs from overall income. However, since income is completely exogenous in the model, this has no direct implications on the model quality. The model also disregards specific German regulations for heterogamous couples, where under specific circumstances one spouse who is not a church member has to pay church taxes for the other who is a member. Since the model looks only at the choice of a single individual, this is neglected.

For the case of Italy, the model disregards the fact that the individual cannot assign his or her personal tax amount to the institution he or she prefers, but only has a vote in the overall distribution of the taxes. For a rich individual, this would mean that by earmarking his or her taxes for the church, only an amount equal to the average tax payment goes to the church, whereas the remainder of this individual's taxes is distributed according to the overall partitioning of *"otto per mille"* revenues.

Second, the model is based on a specific utility function with a standard Cobb-Douglas part and an additive term for utility from church membership. One could particularly question the additivity of the benefits of membership because this assumption implies that membership has no influence on the marginal utility of the other commodities. However, including membership benefits in a Cobb-Douglas type utility function is difficult because this would not allow a discrete choice over the "amount" of membership benefits. The high number of non-members in Germany shows that membership benefits of zero are a common choice whereas in a Cobb-Douglas function the amount of all commodities consumed is strictly

positive. Another possible objection against the Cobb-Douglas utility function is that the marginal utility of income is constant. However, it is often argued that the marginal utility of income is decreasing in reality, which renders the result that church taxes are a heavier burden for the rich than for the poor questionable.[52]

Third, in the model non-members of the church and even individuals with a disutility from membership make voluntary religious contributions. This results from the Cobb-Douglas utility function, combined with the assumption that the marginal utility from religious giving, captured by β_1, and the benefits of church membership, U_{memb}, are independent. In reality, one probably finds a correlation between the two variables, although not a perfect one. In addition, one might even observe a positive relationship between the preference for secular giving, β_2, and the benefits of church membership. Researchers argue that the correlation of religiosity and charitable giving can be explained either by "conviction" or "community" (Bekkers and Wiepking, 2011: 944). "Conviction" refers to inherent "values and attitudes" of individuals, e.g. how much they care about others (Bekkers and Wiepking, 2011: 944). Such values can be transmitted during childhood. When someone grows up in a religious community and internalizes its (usually very positive) position on charitable behavior, he or she will at the same time internalize other values and support the religious community itself, in which case the β parameters and the membership benefit are closely connected. The "community" explanation refers to the fact that individuals who are involved in religious networks might be asked to give more often than others or may experience social pressure to give (Bekkers and Wiepking, 2011: 944). Again, being active in a religious network induces a high membership benefit as well as a high preference for giving. Nevertheless, it is also reasonable to assume that the two variables are not perfectly correlated. In Germany, individuals who seek purely economic benefits from church membership, such as finding a job with a religiously affiliated employer or getting easier access to a church-run kindergarten, need not necessarily be very generous. In addition, individuals might disagree fundamentally with some parts of the church doctrine, which makes them feel uncomfortable with being a church member, but still appreciate some very specific charitable projects of the church. Notwithstanding these objections, a possible correlation between membership benefits and preferences for giving might explain differences between predictions derived from the model and empirical observations. In particular, it could explain why charitable giving of church members (exclusive of church taxes) is often higher than that of non-members.

[52] For a more extensive discussion see the model in Section 4.4.1.

Fourth, in the present model benefits from church membership depend neither on the church tax rate nor on the share of the population with church membership – thereby neglecting the costs of producing these membership benefits as well as possible scale effects in production. It is reasonable to assume that some of the benefits are indeed independent from overall revenues of churches, in particular afterlife benefits that are tied to membership itself. Furthermore, churches currently generate high enough revenues to provide religious festivities like weddings, baptisms or funerals without problems. It is therefore unlikely that individuals take into account that leaving the church or assigning the tax to the state could reduce the availability or quality of these services. Nevertheless, some membership benefits like the availability of clerics do depend on the revenue situation of churches.

Fifth, one could challenge the model on the fact that in the voluntary giving system membership does not have any cost. In reality even in these systems (like the US) membership benefits do at least partly depend on the amount contributed. However, even if this aspect was integrated in the model, the voluntary giving system would still differ significantly from the church tax system because the former allows individuals to choose their individually optimal level of contributions where the marginal cost of an increase in contributions equals the marginal benefit of this increase, while the tax system prescribes the amount of taxes without taking into account the benefits.

Sixth, a comparison of the church disaffiliation decision in Germany and the decision for whom to earmark the assignment tax in Italy is more complicated in reality than it is in the model. The main reason is that the decision that has to be taken in the Italian context can be revised every year, whereas the decision to disaffiliate is usually a long-lasting one which the majority of individuals never revise, or if they do, only after several years. These differences in planning horizons cannot be adequately represented in my simple one period model. The result could be that in Germany people remain church members even if in the current period costs exceed benefits, as long as they expect that in the future benefits will dominate costs. The model also neglects that in Germany changing the church membership status entails transaction costs, both monetary and in terms of time, while this is not the case in Italy. Transaction costs can induce individuals to remain in a status even though the costs exceed the benefits. A discussion of transaction costs in the context of the church membership decision in Germany can be found in Section 4.4.1.

Seventh, the model postulates a clear distinction between religious and secular non-profit organizations, whereas it is sometimes difficult to draw a line between these two in reality. On

the one hand, religious communities are expected to use part of their revenues for their charitable activities, which often lack a strong relation to religious teachings (see Feldhoff, 1996: 38). On the other hand, in Italy a large share of the assignment tax earmarked for the state is used for financing the conservation of cultural heritage, of which the majority belongs to religious communities, in particular the Catholic Church (Pistolesi, 2006: 178). In this vein, one can principally question the implicit assumptions made about the substitutability of charitable goods in the model. My assumption is that church taxes and religious giving are net substitutes – eventually, they buy the same good for the individual. Religious and secular giving do not buy the same good. In contrast, Borgloh (2012) assumes that the church tax is a perfect substitute for all types of charitable giving. In her model the church tax has a much larger effect on secular voluntary giving than in my model.

Eighth, the model does not include the possibility that the financing of a particular activity through the government share of the assignment tax might crowd out funding through regular government revenues. In reality, crowding-out is likely to happen (see Pistolesi, 2006: 173-174). What is more, the Italian government even uses the revenues for non-charitable purposes (Pistolesi, 2006: 175; see also Servizio studi del Senato, 2012: 3-4 and Governo italiano, 2012). In the terms of the model, such behavior would further reduce the fitting parameter of the state and make the church a more attractive alternative for the assignment of the tax.

Finally, the model disregards the fact that different types of voluntary contributions can have different prices. As far as donations are tax deductible, the price is defined as one minus the marginal tax rate. In Germany, church taxes paid are tax-deductible, thereby reducing the amount of income tax that needs to be paid. If voluntary contributions were not tax-deductible, it would be less costly for the individual to pay church taxes instead of giving the same amount of money as a voluntary contribution. However, donations are tax-deductible in Germany, therefore price differences between religious and secular donations do not exist.[53] In the Italian system, a similar logic applies. Assume that the tax code favored the deduction of secular donations, but not of religious giving. If this was true, individuals would have an incentive to attribute their tax to the church and make additional contributions to secular causes.

[53] Borgloh (2012) includes a uniform price for church taxes and voluntary giving in her model. Nevertheless, it should be noted that the amount of donations that are tax-deductible in Germany is limited, whereas church taxes are fully tax-deductible.

3.6.6 Extension of the model

One possible extension of the model which I discuss in some more detail here is how different motivations for voluntary giving affect the outcome of the model. So far it has been assumed that the individual is intrinsically motivated to give. Contributions are made because the individual receives utility from giving to projects which are in line with his or her preferences. This can be seen as a combination of "warm glow" and altruistic giving. On the one hand, the individual receives utility from giving itself (not from the good that is produced, which is not modeled). On the other hand, the donor cares about how his or her money is used, i.e. he or she does not derive utility from giving if the money is not used in line with his or her preferences. Another motive for giving which is discussed in some recent scholarly articles, but has been neglected in the model so far, is social prestige.[54]

3.6.6.1 Motivation

Some previous models concentrate on prestige as the only motivation for making charitable contributions, while others incorporate both prestige concerns and warm glow.

Glazer and Konrad (1996) argue that individuals strive to signal their wealth to other individuals, and that wealth can be signaled by the amount an individual donates. The authors therefore set up a utility function that depends on private consumption and other's inferences about individuals' net income, which in turn is a function of individuals' charitable donations. Glazer and Konrad (1996: 1022) note that the utility function can easily be extended to include warm glow utility.

Bénabou and Tirole (2006: 1656) develop a model where individuals receive utility from private consumption and intrinsic satisfaction from voluntary contributions to a public good (monetary or other), but at the same time care about what others infer about their character and preferences from their giving behavior and the social consequences thereof. Bénabou and Tirole (2006: 1657) go on to explain that the intrinsic motivation of the individual can be grounded both in the concern about the overall level of a public good to which the individual contributes and the pure "joy of giving."

In a similar fashion, Harbaugh (1998) models individuals as receiving utility from private consumption, prestige and warm glow, where warm glow depends on the amount donated and prestige depends on the charity's public reporting of the amount donated. Harbaugh's model coincides with the discussion in Ariely, Bracha and Meier (2009: 544) who state that there are

[54] For a systematic overview of donor motivations see, e.g., von Kotzebue and Wigger (2010).

three motives for voluntary giving: "*[i]ntrinsic motivation*" (e.g. altruism), "*[e]xtrinsic motivation*" (e.g. material rewards) and "*[i]mage motivation*" (which depends on public opinion) (Ariely, Bracha and Meier, 2009: 544 [emphasis in original]).

Soetevent (2005) shows in a field experiment in 30 churches in the Netherlands that individuals give more during services when their contribution is visible to fellow churchgoers than when it is not visible.

I follow the approaches of these authors and model prestige as part of individual's utility. This kind of utility can only be derived from giving that is publicly recognized. In order to leave the model simple, I assume that the individual only cares about prestige and does not derive any utility from giving itself or the goods which are produced with his or her contributions.

The crucial question is then how prestige can be gained in the model. Here I argue that prestige can only be gained through voluntary giving, while paying church or assignment taxes does not entail any prestige. The reason for this assumption is that paying taxes is often seen as a duty, something that needs to be done which is not worth any special recognition. This is surely true for state income taxes, but I also argue that the same mentality is at work with respect to the assignment tax and the church tax. In Germany there is some anecdotal evidence that church members who pay a substantial amount of church taxes do not receive any public recognition for their contributions. Norbert Feldhoff, who was vicar general of the archdiocese of Cologne and responsible for its budget, gives the following example: If a rich person in France or Italy donated 600,000 mark to the church he or she "would have a high reputation and probably get a papal medal" (Feldhoff, 1996: 59 [my own translation]). If the same person lived in Germany, he or she might be obliged to pay 1 million mark of church taxes, but nobody would take notice. If the person was not willing to pay 1m mark, the only possibility would be to disaffiliate, which would result in an excommunication – even if the person still donated 600,000 mark to the church each year. (Feldhoff, 1996: 59) A similar view is expressed in a recent article in the well-known Catholic newspaper *"Christ und Welt"*. The author discusses the view of church officials on rich church members, in particular rich church tax payers. She cites several people working in the finance departments of Catholic dioceses who sustain that there is no – and there should not be – special treatment for rich church tax payers. (Prange, 2012)

Another problem that complicates the extraction of social recognition from church or assignment taxes is the fact that they depend on income, but the income of others is usually

not publicly known, although one can sometimes make an estimation. In contrast, charitable organizations do report the names of their donors and the amount they have contributed.

All these arguments taken together, I argue that paying church or assignment taxes does not provide any prestige for the individual.

A formal model of charitable giving by individuals who are motivated by social prestige can be found in Appendix A.5. Here I give a summary of the results and compare them to the findings from my main model.

3.6.6.2 Results

I briefly discuss the effects of the prestige model for all three systems of church financing, starting with the voluntary giving system.

In the voluntary giving system, the motive for giving does not affect the amount given and the splitting up of giving between religious and secular charitable organizations. The reason is that all voluntary giving is visible, i.e. it can always be given to organizations that make the amount given known to the public.

The same logic applies to non-members of the church in Germany. Since all their giving is voluntary, they can choose organizations that publish the names of donors. In contrast, for church members the motivation to give matters. In the prestige model everyone who cares to some extend about public recognition makes an additional (non-tax) charitable contribution because only non-tax contributions create prestige. In other words, corner solutions where individuals do not give voluntarily are not possible. Therefore, on average, church members' religious giving is larger and secular giving is lower than in the previous framework, which implies that the prestige model predicts an even larger bias of giving away from secular organizations and directed to churches. However, total voluntary giving is also larger in the prestige model.

In addition, I find that the critical level y^*, i.e. the income where individuals are indifferent between being and not being a church member, is lower in the prestige model. The reason is that in the previous framework individuals usually gained at least some utility from paying their church taxes (besides membership utility), but in the prestige model they do not. Consequently, the model predicts that the more individuals are motivated by gaining social recognition with their charitable contributions, and the less they are intrinsically motivated to give, the lower will be the church membership rates.

Finally looking at the tax assignment system, I find that in the prestige model the amount given to charitable causes (including the assignment tax) and the utility of the individual are independent of whether the money is given to religious or secular causes. The individual is completely indifferent between attributing his or her taxes to the state or to the church. If one assumes that the two alternatives are chosen with the same probability, both religious and secular organizations can gain in revenues in comparison to the voluntary giving model. The prestige model helps to explain why many Italians do not use the opportunity to decide whether they want to assign the tax to the church or the state by leaving the relevant part of the tax form blank. In the regular solution of the main model individuals made their choice on the basis of the fitting parameters a and b. However, if individuals only care about prestige, but not about how the money given is used (which is reflected in the fitting parameters), there is no meaningful decision criterion left for the individual.

A possible track for further research could be to integrate both the intrinsic and the presige motivation to give into the utility function of the individual. Such a model could help to explain different empirical facts about giving in countries where church tax and tax assignment systems exist. On the one hand, the reputational considerations help to explain why few individuals decide for one of the alternatives in the tax assignment system. On the other hand, when the individual only cares about how his or her money is used, non-tax giving can be zero when the individual arrives at his or her preferred level of giving by paying church or assignment taxes.

3.6.7 Conclusions

Despite these limitations, the model gives insights into the economic incentives set by different church financing systems. It also provides testable hypotheses regarding the church membership and voluntary giving decisions in the countries under investigation. Although the model is not dynamic, it allows for the comparison of two individuals who differ in the relevant parameters, or one individual at two points in time when there is an exogenous change in the model parameters. However, I do not know how the individual moves from one state to the next. In the following I summarize the hypotheses derived from the model regarding the church tax system in Germany, which will be tested empirically in the subsequent chapters:

- A higher taxable income or a higher church tax rate c.p. increases the probability that the individual is not a church member.

- Individuals who have the same income and face the same church tax rate can differ in their church membership decisions if (i) they have different levels of membership benefits, U_{memb}, (ii) they differ in how much the spending decisions of the church reflect their preferences (parameter a) or (iii) they differ in the marginal utility from giving, characterized by β_1 and β_2.
- If two church members differ only in membership benefits, both give the same amount of money to charity. If they differ only in the fitting parameter a, those with a lower level of a give more for religious purposes and less for secular purposes. If they differ only in the marginal utility from giving,[55] then religious and/or secular giving of those with smaller values of β_1 and β_2 is lower.
- The obligation to pay church taxes reduces additional (non-tax) charitable giving of church members – both for religious and for secular purposes.
- Assuming that two individuals have the same income, the same fitting parameter a, the same marginal utility of giving β_1 and β_2 and face the same church tax rate, but differ in church membership status (e.g. because one has a higher membership benefit than the other), the non-member gives more to religious purposes than the church member, who either makes no additional contribution at all (corner solution) or a comparatively small contribution. The non-member also gives more to secular causes. However, the overall giving of the church member, including both church taxes and additional voluntary giving, is higher than giving of the non-member.

[55] This is only valid for sufficiently low values of β_1 and β_2. However, it is true if the reasonable assumption $\beta_1 + \beta_2 < 0.5$ is fulfilled.

4 CHURCH TAXES AND CHURCH DISAFFILIATION: AN EMPIRICAL STUDY FOR GERMANY, 2001-2006

4.1 Introduction and research questions

The model in Chapter 3 has illustrated that the institutional setting, in particular the church financing system, can influence the church membership decision. For the case of Germany, the model suggests that a higher church tax and a higher income, as well as lower individual benefits from membership, increase the probability of an individual's disaffiliation. While there is plenty of rather qualitative research on the effect of the church tax on church disaffiliation, which I review in Section 4.3, quantitative research is sparse. So far I am aware of only two studies. Lyytikäinen and Santavirta (2013) look at Finland, which has a church tax system that is in some regards similar to the German one. For Germany, Borgloh (2012) investigates the effect of the church tax on the church membership decision with the Taxpayer Panel, a large data set containing information from income tax returns. The same data set is also used in the research at hand.

Against this background, this chapter aims to mitigate the lack of research in the field of economics of religion in Germany and contribute to the knowledge about the effects of specific institutional regulations on religiosity. Particularly, my first research question is:

- *Is there a statistically significant relationship between a person's church tax payments and his or her decision to formally leave the church?*

In addition, I ask:

- *How and to what extent do demographic and socio-economic characteristics of the individual influence the decision to leave the church?*

and finally:

- *Are there are regional differences within Germany in the church membership decision?*

The chapter is structured as follows: the next section gives a short account of church membership change and church disaffiliations in Germany and describes the institutional background of church financing in Germany. Section 4.3 reviews the literature on benefits and costs of church membership, in particular church taxes. Section 4.4 develops hypotheses

both in the framework of a simple model of church membership choice and from a literature review. These hypotheses are later tested empirically. The data and the estimation strategy will be presented in Sections 4.5 and 4.6. Section 4.7 presents the findings, while Section 4.8 concludes and discusses questions for further research.

4.2 Historical and legal background: Church membership and church disaffiliations in Germany

4.2.1 Historical background

Church disaffiliation is not a new phenomenon. In fact, people have been leaving the church since this was legalized in the late 19th century. High disaffiliation rates have been observed during the 1920s and 1930s, which is attributed to anti-religious propaganda of the major political parties of these decades (Feige, 1990: 126-134). After the end of the Second World War disaffiliation numbers in the Western part of Germany were low again, until they increased rapidly beginning in 1968. The numbers never returned to the low levels of the post-war period and finally reached unprecedented dimensions after German reunification in 1990. (Daiber, 1995: 164-165; Pollack, 2001: 1053-1054)

In East Germany, church disaffiliation levels were incomparably higher. The Communist government actively restrained activities of religious organizations, e.g. their opportunities to collect church taxes and provide religious education. Church members were faced with disadvantages in their educational and professional careers. Religious rituals were replaced with secular ones, such as celebrating *"Jugendweihe"*[56] instead of confirmation. As a result, the church membership rate in East Germany dropped from more than 90 percent in 1950 to around 30 percent at the time of German reunification. (Henkys and Schweitzer, 1997; Pollack, 2000: 19; Barker, 2004: 168-169; Froese and Pfaff, 2005: 405-407; Pfaff, 2011: 240-243) After reunification, disaffiliation numbers jumped up again in East Germany; however, disaffiliation rates in East and West Germany have been quite similar in recent years.

The large differences in religiosity and religious membership between the two parts of Germany make the country an interesting case study because hypotheses can be tested with exactly the same kind of data in two completely different settings.

As I have already pointed out in the introductory chapter (see Section 1.3), the number of church members in Germany is diminishing not only due to church disaffiliations, which are part of the "behavioral" component of membership development, but also because of "natural" changes (Eicken, 2006: 178). The latter are brought about by demographic change, since the number of church members who die is constantly higher than the number of children who are born to (Christian) religious parents and are baptized. The "behavioral" and "natural"

[56] *"Jugendweihe"* is a secular formal celebration of the beginning of adulthood.

components are the two major sources for the decline in church membership in Germany (Eicken and Schmitz-Veltin, 2010). This research addresses the behavioral component of membership change, especially disaffiliations, and seeks to uncover the economic rationale of this decision in the current German institutional framework.

Church disaffiliations have been discussed in the German theological and sociological literature since the 1970s (see, for example, Feige, 1976; Birkelbach, 1999; Hoof, 1999; Löffler, 2007). A number of studies have also been commissioned by churches themselves (see Huber, Friedrich and Steinacker, 2006, for a study on Protestants; Schmidtchen et al., 1972, and Institut für Demoskopie Allensbach, 1992, 1993, for studies on Catholics). Recently the economic dimension of disaffiliations is becoming more and more important. Church tax revenues have been declining in real terms since the early 1990s, with some short recoveries in times of high economic growth (at the end of the 1990s and between 2006 and 2008) (Petersen, 2010: 41). The number of future taxpayers is predicted to decline significantly. Therefore churches will increasingly face considerable financial strain which becomes even more severe with every (potential) taxpayer who decides to disaffiliate (Petersen, 2007: 752-753).

4.2.2 Legal background[57]

In Germany, the major Christian churches (the Catholic Church and Evangelical Church in Germany) are granted the right to collect taxes from their members (Daiber, 1995: 70-71). All baptized individuals are considered members unless they officially disaffiliate. These taxes constitute by far the largest source of revenue for the two major Christian denominations.

Church taxes come in different forms. The most important form that generates the bulk of church tax revenues is an additional tax to the federal income tax. In some regions churches levy property taxes, but the revenues are negligible. In addition, some churches collect (obligatory or voluntary) local church taxes *("Kirchgeld")*, which are either fixed or depend on the church member's income.[58] In most federal states, the revenues generated are negligible. Last, there is a special church tax for heterogamous marriages *("besonderes Kirchgeld in glaubensverschiedener Ehe")*, which is applied when a church member who does not have a sufficiently high income and thus does not pay church taxes is married to a

[57] For a comprehensive overview over all legal aspects of church membership and church taxes in Germany, see Petersen, 2010.

[58] In contrast to church taxes on income, local church taxes are not collected by the state tax office, but by the local congregations themselves. Payment is usually not enforced (Petersen, 2010: 73), therefore the obligatory character of the tax is questionable.

non-member. In this case, the non-member has to pay church taxes for his or her religiously affiliated spouse from his or her own income. (Petersen, 2007: 754-755) In what follows, I focus attention on the church tax as an additional tax to the income tax, because it is collected by state tax offices and individual data is available.[59] It should be noted that church members who do not have taxable income (e.g. most pensioners) are not obliged to pay church taxes (Daiber, 1995: 73).

Church taxes are collected by state tax offices along with income taxes. They are often subtracted from a person's salary by the employer. At the end of the year, people are usually obliged to file a tax return and will eventually have to make a subsequent payment or receive a tax refund. The church tax then amounts to 8 % or 9 % of income tax liabilities. The sum of church taxes paid during a year is tax-deductible. Like the German income tax system in general, the church tax is progressive. In most German Länder a maximum church tax rate exists (generally around 3.5 % of taxable income). Church tax regulations vary slightly between the German Länder, but the tax rate is the same for members of both the Catholic and the Protestant Church in the each Land. Detailed information about church tax regulations can be found in Appendix B.

Individuals can disaffiliate from the church during the whole year. Church membership and the duty to pay church taxes end either at the end of the month when the person opts out of church or the end of the subsequent month. Church taxes are then calculated proportionately to the number of months that the person was a church member during the year. The basis for taxation is the income of the whole year, which also includes income that was earned after disaffiliation. Church disaffiliation has to be declared personally and in written form with a public authority – either the civil registry office *("Standesamt")* or the district court *("Amtsgericht")*. It is not possible to declare disaffiliation only from the church as a public body (and avoid church taxes), but to remain a member in the church in its spiritual sense. Usually the public authorities charge a fee for church disaffiliation.[60] The fee usually does not vary within a Land but does between different Länder. The average fee is between 20 and 30 euro, with a maximum of 60 euro.[61] (Petersen, 2010: 137) For detailed information about the regulations concerning church disaffiliation, consult Appendix B.

[59] For the same reason I concentrate on members of the two large denominations in my empirical analysis.
[60] Berlin and Brandenburg are exceptions.
[61] For detailed information about fees, see Petersen (2010: 137) and http://www.kirchenaustritt.de/info/.

4.3 Theoretical and empirical perspectives on church membership decisions in a cost-benefit framework

I this chapter I investigate the discrete decision between being and not being a church member, and I am specifically interested in the effect of the amount of church tax that has to be paid in the case of membership. Discrete decisions are rarely described in microeconomic theory. An exception is Maier and Weiss (1990), who provide a comprehensive overview of the topic.[62] In the case of discrete decisions, consumers maximize their utility by holding constant the level of consumption of the discrete good. They compare the conditional utility levels of all discrete alternatives and decide for the alternative which yields the highest utility. This requires taking into account both benefits and costs associated with the different options.

The benefits of church membership are multifaceted. Stark and Finke (2000: 145-150) extensively discuss that "[m]embership in any religious organization involves both religious and social-emotional rewards" (pp. 145-146). In general, benefits are created not only for the individual itself, but also for the society. Economic models, such as Azzi and Ehrenberg (1975) (see also Section 2.2.1) focus on private benefits for church members. In the model of Azzi and Ehrenberg (1975) the most important benefit provided by religious organizations is "afterlife consumption" (Azzi and Ehrenberg, 1975: 32), which is the sum of utility a person receives in life after death. However, in Germany only 37 % of the inhabitants believe in life after death while 15 % believe in hell (Köcher, 2009: 803). Therefore "afterlife consumption" seems to play only a secondary role in church membership assessment. Unfortunately, to the best of my knowledge there is no research about the expectations of (former) church members about the consequences of church disaffiliation on their afterlife utility.

Another private benefit of church membership is "current satisfaction" (Azzi and Ehrenberg, 1975: 32), which encompasses, among others, meaning in life and entertainment. In fact, participation in church festivities like weddings is the single most important reason for church membership among Protestants in West Germany (Schloz, 2006: 61). In contrast, attendance at regular religious services is low. Only about one in four Protestants attends services at least once a month, while about 40 % go to church at best once a year (Schloz, 2006: 54-55). However, when a large share of a person's reference group attends church, "social pressure" (Azzi and Ehrenberg, 1975: 32) may exist and being a non-member can reduce the private utility of an individual (Papyrakis and Selvaretnam, 2011: 441). There is no statistical data on

[62] Meier and Weiss (1990) is the basis of the discussion in this section and of the model in the next section.

social pressure in church membership decisions, but the general perception is that nowadays disaffiliation is widely accepted and does not lead to negative consequences. However, the situation might still differ between rural and urban areas and also between Northern and Southern Germany as well as East and West Germany because membership rates are largely different in these regions.

Individuals can also derive benefits from public goods and social services provided by religious organizations, such as "social rules", "property rights enforcement", "preservation of knowledge", education, "income redistribution" (Hull and Bold, 1989: 8), maintenance of historically important buildings and provision of social capital (Coleman, 2003). In Germany, churches also have a decisive role in the provision of welfare services like kindergartens, care for the elderly, the poor and the handicapped, aid to developing countries, etc., which are partly financed through church taxes. Many individuals receive direct private benefits from using these services, while others may be motivated by altruism or warm glow and derive utility from contributing to the provision of these services. In fact, providing care for the elderly, sick and handicapped is on top of a list of things which Germans expect from the churches – members as well as non-members, East Germans as well as West Germans (Pittkowski, 2006: 107). Almost all church members agree that some or even a large share of church tax payments should be used for supporting the elderly, the needy and children (Köcher, 1993: 24). More than 40 % of church members strongly agree that these activities are a reason for their membership (Schloz, 2006: 61). Another potentially important reason for church membership lies in the fact that often only church members can be employees of church organizations and religious social service providers. Since a large share of hospitals, nursing homes and day-care facilities are religiously affiliated (see Section 1.2), church membership can have a great influence on the job opportunities of persons working in the social sector.

Many of the benefits provided by churches are not restricted to members, such as participation in services. Lyytikäinen and Santavirta (2010: 35-36) name the following benefits that are exclusively enjoyed by church members in Finland: church wedding, baptizing, confirmation, funeral, godparenthood and free subscription to the church's magazine. For Germany, the list can be supplemented by (easier) access to church kindergartens and religious private schools and scholarships for students (Hoyer, 2011).

In the German context, the most important costs of church membership are church taxes.

Researchers broadly agree that the decision to disaffiliate is the consequence of a cost-benefit analysis (Dubach, 1993: 138-139; Stark and Finke, 2000: 42-56; McCleary, 2011: 9). However, the decision to leave the church is usually characterized as a long-lasting decision making process (Feige, 1976: 232; Institut für Demoskopie Allensbach, 1993: 3-4) and individuals who disaffiliate usually give more than one reason for this decision (Hoof, 1999: 200-204). They might gradually reduce their church attendance (Gill and Lundsgaarde, 2004: 411) or develop values and opinions that differ from those of their denominations (Brañas-Garza, García-Muñoz and Neuman, 2007: 22). The apparent "inertia" in church membership decisions might also be caused by the transaction costs involved (Birkelbach, 1999: 137), such as finding out how to formally disaffiliate, going to the civil registry office or district court, and paying a fee. Benefits and costs of church membership are often reassessed after important (economic) changes in the individual's life or in society (Feige, 1990: 226; Hoof, 1999: 242). Significant changes in the costs of church membership occur when people enter the labor market (and have to pay church taxes for the first time), when they face significant income changes, financial problems or new income tax regulations (Birkelbach, 1999: 138). Other instances when people revisit their church membership status include: dissatisfaction with (statements of) church representatives, scandals and critical media coverage (Feige, 1976: 203), arguments with the pastor or congregation members (Hoof, 1999: 205), discussions with persons who have already disaffiliated (Feige, 1976: 206) or relocation (Feige, 1976: 236).

Studies differ in the importance that they ascribe to church taxes in the membership decision. Some find that the church tax is not seen as a burden or considered too high by the majority of church members (Institut für Demoskopie Allensbach, 1992: 21; Huber, Friedrich and Steinacker, 2006: 460). In fact, most people have only limited knowledge about the amount of church tax they pay and how the tax is calculated (Köcher, 1993: 17-20; Huber, Friedrich and Steinacker, 2006: 460; Bassler, 2008: 315-319). Surveys among former church members find that these people name more than one motive for leaving the church, church taxes are rarely cited as a sole motive (Feige, 1976: 158; Institut für Demoskopie Allensbach, 1993: 25). Disapproval of the church tax might be easier to express than criticism of the church itself, therefore it is a popular and easy argument (Institut für Demoskopie Allensbach, 1992: 12; Hoof, 1999: 206-207). Some researchers conclude that church taxes are merely a catalyst, but not the true motive for disaffiliation (Institut für Demoskopie Allensbach, 1992: 17-20; Hoof, 1999: 202; Ihli, 2011: 194).

Still, church taxes rank high in the list of reasons to opt out (Müller-Weißner and Volz, 1991: 22; Institut für Demoskopie Allensbach, 1993: 21-22; Engelhardt, von Loewenich and Steinacker, 1997: 326-327; Pittkowski, 2006: 94-95) and a factor analysis of reasons for disaffiliation reveals that church taxes are an independent factor that is uncorrelated with all other motives for disaffiliation (Engelhardt, von Loewenich and Steinacker, 1997: 326-330; Pickel, 2011: 54-55).[63] Among those who consider disaffiliating the perception of paying too much is stronger than among loyal members and the share of individuals who do not pay any church taxes is lower (Hanselmann, Hild and Lohse, 1987: 112; Institut für Demoskopie Allensbach, 1992: 21).

However, even loyal members can be critical of church contributions. Only 39 % of Protestants in West Germany believe that it is self-evident that Christians should pay church taxes, although only 28 % favor the abolition of church taxes (Huber, Friedrich and Steinacker, 2006: 461).[64] The hypothesis that church taxes do play an important role in church membership decisions is also supported by the observations that the highest numbers of church disaffiliations in Germany were recorded in years when additional (secular) taxes were introduced and that both the Catholic and Evangelical Church in Germany faced almost identical waves of membership losses (Birkelbach, 1999: 137; Pollack, 2001: 1053-1054). Froese and Pfaff (2005: 413) ascribe the persistent lack of interest in religion in East Germany after reunification (which is in contrast to the situation in other former communist countries) to the introduction of church taxes in East Germany where church contributions had been voluntary since the 1950s. Dubach (1993: 141-142) finds that in Swiss cantons where churches collect taxes the propensity to disaffiliate is much higher than in those cantons where churches do not raise taxes. He argues that people will seriously consider disaffiliating only when being a member entails obligations such as paying church taxes. Donzé (1998: 105) argues in the same direction as Dubach (1993) when he suggests that without church taxes, individuals would leave the church internally, but the tax necessitates the formal act. Feige (1976: 236) and Müller-Weißner and Volz (1991: 22) conclude from monthly differences in membership cancellations that membership decisions are often taken when people are forced to think about taxes, e. g. when they fill in their tax returns. Similarly,

[63] A survey among people who have left the Evangelical Church in Germany (Pittkowski, 2006) finds that in West Germany the reason for leaving which most respondents agree to is the perception that people can be Christians without being church members. Saving church taxes gets an almost equally high level of support as a reason for disaffiliation, followed by statements such as "I find the church untrustworthy" and "I don't care about the church" (Pittkowski, 2006: 94-95 [my own translation]). Many respondents also state that they are not religious anymore and have a different value system.

[64] This survey also reveals that support for the church tax system is higher among Protestants in East Germany.

Lyytikäinen and Santavirta (2013) find that in Finland people usually drop out of the church at the end of the year and explain this finding with the fact that church taxes have to be paid for the whole calendar year. Moreover, Birkelbach (1999: 146, 150) finds that church membership cancellations peak when individuals start their first paid job and disaffiliation rates are higher in years when people are employed than when they are not working.

The first quantitative research about the effect of church taxes on church membership that I am aware of was conducted by Lyytikäinen and Santavirta (2013) on a large panel of Finnish tax return data. The authors estimate the influence of the previous year's church tax and income as well as household characteristics on the probability of church membership, using a linear probability model. They find a significant negative, but moderate, effect of church taxes on the probability of church membership. A one standard deviation increase in church taxes reduces the probability of being a church member in the following year by roughly one percent. Analysis by household type reveals that singles show the strongest reaction to changes in the church tax. Furthermore, the authors find a negative effect of household income on membership.

Borgloh (2012) tests empirically whether individuals' decisions on church disaffiliation depend on the costs of church membership, using a large sample of the German Taxpayer Panel, which is also used in this chapter. She starts from the assumptions that church taxes are perfect substitutes for other types of voluntary giving. If this assumption is correct, individuals who are church members, but do not make any additional donations, do so because the church taxes they have to pay equal or exceed the amount they are willing to give voluntarily. In other words, the costs of membership tend to be too high. Consequently, these members should be more likely to disaffiliate when their church tax liability increases. Borgloh's results confirm the hypothesis: among those individuals whose church tax liability has increased, those who do not donate are more likely to disaffiliate. Her research indicates that there are indeed some individuals who leave the church because the price of membership exceeds the amount they are willing to pay voluntarily. However, she does not directly measure the effect of the price of membership on the probability of disaffiliation. In fact, the price of membership is not included in her estimation equation. She also restricts the sample to individuals who experience an increase in the amount of church tax they have to pay, which

prevents her from testing whether increases and decreases in the price of membership have symmetric effects on the decision to leave the church.[65]

The discussion so far suggests that church disaffiliation decisions can be characterized as a cost-benefit analysis. When the benefits are large from the point of view of church members, the costs are less important (Köcher, 1993: 22), but when the social pressure to be a member decreases and competing institutions such as the welfare state or the leisure sector (Stolz, 2010: 257) provide public goods or can be used for current satisfaction, costs become a decisive issue and can be the catalyst for a church disaffiliation. Various empirical observations support this view.

[65] Furthermore, my research differs from Borgloh's in some methodological aspects. First, she looks at individually and jointly assessed taxpayers while I restrict my research to individually assessed taxpayers (see Section 4.5.2). Second, her independent variables are defined as one year lagged values or as changes between the first and the second lag of a variable. In my research, changes in independent variables are calculated over a longer time period.

4.4 Model and hypotheses

4.4.1 A model of church membership as a binary choice

In this section I develop a theoretical model that formalizes the church membership decision in a cost-benefit framework, with church taxes as the main type of costs. I adopt the model to the German institutional environment and to the specific research questions of this chapter. In particular, I model a discrete decision about (formal) church membership and I include the German church tax regulations in detail. My theoretical approach to modeling discrete consumption choices is "conditional optimization", i.e. individuals maximize their utility given each of the discrete alternatives and then decide for the alternative with the highest utility level. This approach was developed by Pollak (1969, 1971) and is thoroughly discussed in Maier and Weiss (1990). In fact, the design of the model is based on Maier and Weiss (1990).[66]

The following model also refines the model specified in Chapter 3, but with some significant differences. The model in Chapter 3 had various objectives: it was designed to illustrate the influence of the church financing system on both the church membership decision and on voluntary contributions. At the same time, it was built to enable the comparison of different church financing systems. Because of the variety of aims, some simplifications had to be made.

In this chapter I concentrate only on the German church financing system. The sole aim of the model is to illustrate the church membership decision. Therefore I completely neglect voluntary giving. In the model that follows, individuals only spend money on secular consumption and church membership. In this respect, I assume that individuals have a purely private benefit from being a church member, U_{memb}. The individual does not care about how the church contribution is used. In addition, I model the German church tax system in more detail. In the last chapter I assumed that the church tax has a fixed tax rate which is applied to income. In the present model, I account for the fact that the amount of church tax is determined by the church tax rate, but also by the income tax scale. Furthermore, I add transaction costs of changing church membership status to the model because they can have a large effect on the church membership decision. Another difference between the two models

[66] An application of the "conditional optimization" approach is Kotchen and Moore (2007). Here individuals choose between contributing a fixed amount of money to a public good or making no contribution at all.

is that I no longer assume a specific utility function, such as the Cobb-Douglas function in the model in Chapter 3.

An individual is assumed to maximize utility over a bundle of secular goods, denoted C, and church membership, denoted D_M. Secular goods C can be consumed in continuous quantities, whereas D_M is discrete with $D_M \in \{0; 1\}$. If $D_M = 1$, the individual is a church member; if $D_M = 0$, the individual decides not to consume the good "church membership". Utility also depends on characteristics of the individual, such as age, gender, civil status, region of residence, etc., which I summarize in the vector X.

The utility function can be summarized as

$$U = U(D_M, C, X) \tag{4.1}$$

I assume that the utility function is additively separable,

$$U(D_M, C, X) = u(D_M, X) + v(C, X) = \begin{cases} v(C, X), & D_M = 0 \\ U_{memb}(X) + v(C, X), & D_M = 1 \end{cases} \tag{4.2}$$

and that church membership yields an individual-specific fixed (gross) utility U_{memb}, $-\infty \leq U_{memb} \leq \infty$.[67] Utility v is increasing in secular consumption C at decreasing rates: $\frac{\partial v(C,X)}{\partial C} > 0, \frac{\partial^2 v(C,X)}{\partial C^2} < 0$. Additively separable utility functions have also been used in previous models in the economics of religion, such as Durkin and Greeley (1991) and Pyne (2010). In my model, as in many previous models, benefits of membership are bought at the cost of reduced secular consumption. In many contributions in the economics of religion gross benefits of church membership or religiosity are dependent on how much the individual pays. However, I decided to model them as fixed, not only because this simplifies the model, but also because it represents the actual situation in Germany where the major religious communities are anxious not to give privileges to high-income church tax payers.

The budget constraint is

$$(1 - \tau^s) * y = \begin{cases} p_C * C + p_M * D_M & , \quad D_M = D_{M,0} \\ p_C * C + p_M * D_M + \Delta(X), & D_M \neq D_{M,0} \end{cases} \tag{4.3}$$

[67] In the context of the model, U_{memb} denotes only those benefits which are exclusively granted to church members. The (possible) creation of public goods which can be enjoyed by both church members and non-members is not part of the model.

where y denotes exogenously given income, τ^s is the average income tax rate, p_C is the price of the bundle of secular consumption goods, p_M is the price of church membership, and $D_{M,0}$ is the original church membership status, which indicates whether someone is a church member when he or she takes the church membership decision, $D_{M,0} \in \{0; 1\}$, where $D_{M,0} = 1$ identifies a church member. If the individual decides to change his or her church membership status, $D_M \neq D_{M,0}$, he or she has to pay transaction costs $\Delta(X)$. Transaction costs for leaving the church include the effort to find out where and how to disaffiliate, the time to go there and declare disaffiliation and usually a fee that has to be paid. Joining the church requires going to a church authority in person, although it is free of charge. Transaction costs depend on individual characteristics X since they differ between Länder in Germany and sometimes fees are reduced for spouses who disaffiliate together as compared to unmarried individuals.

Formalizing the German church tax system, the price of church membership is largely determined by the church tax,[68] which in turn depends on income, therefore

$$p_M = T(\tau^k, \tau^s, y, X), \tag{4.4}$$

where $T(.)$ describes the church tax scale and τ^k is the church tax rate (which is currently 8 % or 9 % in Germany, depending on the Land) that the church imposes on the income tax.[69] The church tax scale is determined both by church tax laws that are made by the religious communities themselves as well as state legislation on the personal income tax. The reason is that the tax base of the church tax is not income itself, but the income tax.[70] Taking the income tax as the tax base has several implications: first, the church tax is progressive with respect to income – as far as the income tax is progressive, too. Second, changes in the income tax scale heavily affect the amount of church tax that needs to be paid and third, all changes in the definition of taxable income also influence the amount of church taxes. All aspects introduce additional sources of variation in the amount of church tax although they are solely determined by state legislation. Even if both income and church tax rates remain constant, a change in the state income tax system will affect the tax amount.[71] In order to distinguish the church and state influence on the church tax scale, I write

[68] How the price of church membership is defined in my empirical estimations is discussed in Section 4.5.4.
[69] I abstract from both minimum church taxes and maximum church tax rates.
[70] In this respect the German system is similar to the tax assignment system in Italy *("otto per mille")*, but differs from church taxes in Finland, where the tax base is taxable income.
[71] In principle, churches have the possibility to adjust tax rates to changes in the income tax system. In practice, however, they rarely take advantage of this possibility. In the period 2001 to 2006 income tax laws have been

$$T(\tau^k, \tau^s, y, X) = \tau^k * \tau^s(y, X) * y \tag{4.5}$$

Since the church tax rate is independent from characteristics of the individual such as his or her taxable income, I assume $\frac{\partial T}{\partial \tau^k} > 0$ and $\frac{\partial^2 T}{\partial (\tau^k)^2} = 0$. Further, $\tau^s(y, X)$ is the average income tax rate. It is determined by the income tax legislation, in particular the income tax function established in § 32a of the German income tax law and the definition of taxable income established in the income tax law.[72] The income tax an individual has to pay depends in part on his or her personal characteristics X, e.g. on the age of the taxpayer, the type of income he or she earns and whether he or she has children. It is safe to assume that an increase in income leads to an increase in taxable income. The income tax function itself is progressive in income, therefore $\frac{\partial \tau^s}{\partial y} > 0$.

Consumers maximize their net utility given each discrete level of the good "church membership", D_M, and decide for the alternative which yields the highest net utility. Thus, one can rewrite the budget constraint (4.3) such that there is a separate constraint for each discrete value of D_M,

$$p_C * C = \begin{cases} y^s(\tau^s, y, X) - \Delta_l(X) * D_{M,0}, & D_M = 0 \\ y^s(\tau^s, y, X) - T(\tau^s, \tau^k, y, X) - \Delta_j(X) * (1 - D_{M,0}), & D_M = 1 \end{cases} \tag{4.6}$$

where $y^s(\tau^s, y, X)$ is the income after income tax and is defined as

$$y^s(\tau^s, y, X) = [1 - \tau^s(y, X)] * y \tag{4.7}$$

and $\Delta_l(X)$ and $\Delta_j(X)$ denote the transaction costs of leaving and joining the church, respectively. Transaction costs are only incurred when individuals change their church membership status, i.e. when $D_{M,0}$ and D_M do not coincide. Without loss of generality, I set p_C to one.

I now derive the conditional indirect demand function for the bundle C as

changed significantly (both concerning the definition of taxable income and the tax function), while church tax rates remained constant.

[72] My definition of income y is broader than the definition of taxable income in the German income tax law. In my model differences between income and taxable income (e.g. if some parts of income are not taxable) are reflected in the average income tax rate τ^s.

$$C^*(\tau^s, \tau^k, y, D_M, D_{M,0}, X)$$
$$= \begin{cases} y^s(\tau^s, y, X) - \Delta_l(X) * D_{M,0}, & D_M = 0 \\ y^s(\tau^s, y, X) - T(\tau^s, \tau^k, y, X) - \Delta_j(X) * (1 - D_{M,0}), & D_M = 1 \end{cases} \quad (4.8)$$

Inserting the conditional indirect demand function and the corresponding discrete values of D_M into the utility function yields the conditional indirect utility function

$$\widehat{U}[D_M, C^*(\tau^s, \tau^k, y, D_M, D_{M,0}, X), X]$$
$$= \begin{cases} v\big([y^s(\tau^s, y, X) - \Delta_l(X) * D_{M,0}], X\big), & D_M = 0 \\ U_{memb}(X) + v\big([y^s(\tau^s, y, X) - T(\tau^s, \tau^k, y, X) - \Delta_j(X) * (1 - D_{M,0})], X\big), & D_M = 1 \end{cases} \quad (4.9)$$

The individual now chooses the level of D_M which maximizes his or her indirect utility function $\widehat{U}[D_M, C^*, X]$. The individual decides against church membership if $v([y^s - \Delta_l], X)$ is large enough in comparison to $v\big([y^s - T - \Delta_j], X\big)$[73] to compensate for the loss of the gross benefit of membership U_{memb}, i.e. if the individual values the greater secular consumption opportunities as a non-member higher than the gross benefits from church membership. This decision depends on personal characteristics, the utility from church membership, the church tax, transaction costs and the income y of the individual. The higher the utility of church membership, the less likely it is that individuals are non-members. If membership benefits are negative, i.e. when there is a disutility from membership, and transaction costs are moderate, individuals will not remain church members. These model results are in line with previous models such as Papyrakis and Selvaretnam (2011: 449) and with my own model from Chapter 3. Transaction costs always reduce consumption opportunities for the individual. Since they are only relevant when the individual changes his or her church membership status, they lead individuals to remain in their current church membership status. In other words, they increase the gap between benefits and costs of membership that is necessary to induce individuals to change their membership status.

Assuming that personal characteristics and benefits of membership remain constant, I derive comparative static results for changes in the church tax rate and in income. I start by looking at the effects of an exogenous change in the church tax rate τ^k.[74] This variable is determined

[73] In order to ease the discussion, I write Δ_l instead of $\Delta_l(X) * D_{M,0}$ and Δ_j instead of $\Delta_j(X) * (1 - D_{M,0})$. However, one should keep in mind that transaction costs are only incurred when the church membership status changes.

[74] Churches also have (limited) influence on the definition of the taxable income. The most relevant difference between the state's and the church's definition of taxable income is the deduction of an allowance for each dependent child. In this model I make the simplifying assumption that taxable incomes for the calculation of the church tax and the income tax are the same.

by church bodies and is mostly independent from state intervention. Differentiating $\widehat{U}[D_M, C^*, X]$ with respect to the church tax rate τ^k yields

$$\widehat{U}_{\tau^k}[D_M, C^*(\tau^s, \tau^k, y, D_M, D_{M,0}, X), X] = \begin{cases} 0, & D_M = 0 \\ -v_{C^*}\left(\left[y^s(\tau^s, y, X) - T(\tau^s, \tau^k, y, X) - \Delta_j(X) * (1 - D_{M,0})\right], X\right) * \tau^s(y, X) * y < 0, & D_M = 1 \end{cases} \quad (4.10)$$

where subscripts relating to U and v denote the first derivatives. The first derivative of the utility function with respect to τ^k is negative. While the utility level of non-members ($D_M = 0$) remains constant, the indirect utility of church members ($D_M = 1$) decreases. Therefore an increase in the church tax rate reduces the probability that an individual is a church member and increases the probability of disaffiliation.

As I discussed earlier, a change in church taxes can also be caused by a change in the income tax scale or the definition of taxable income, which are summarized in the average income tax rate $\tau^s(y, X)$. An exogenous increase in the tax scale or the introduction of a more extensive definition of taxable income cause an increase in $\tau^s(y, X)$. The first derivative of $\widehat{U}[D_M, C^*, X]$ with respect to τ^s is

$$\widehat{U}_{\tau^s}[D_M, C^*(\tau^s, \tau^k, y, D_M, D_{M,0}, X), X] = \begin{cases} -v_{C^*}\left(\left[y^s(\tau^s, y, X) - \Delta_l(X) * D_{M,0}\right], X\right) * y, & D_M = 0 \\ -v_{C^*}\left(\left[y^s(\tau^s, y, X) - T(\tau^s, \tau^k, y, X) - \Delta_j(X) * (1 - D_{M,0})\right], X\right) * & \\ (1 + \tau^k) * y < 0, & D_M = 1 \end{cases} \quad (4.11)$$

A change in the income tax rate affects church members and non-members differently. While non-members only face a higher income tax and the reduced consumption opportunities, church members additionally have to pay higher church taxes. On top of that, *ceteris paribus* the after-tax income of church members is always lower than that of non-members (due to the church tax payment), which means that under decreasing marginal utility of income a decrease in income has a larger negative effect on the utility of church members than on the utility of non-members. In sum, an increase in the income tax rate reduces the utility of church members more than the utility of non-members.

Next, I focus on the effect of an income change. Differentiating $\widehat{U}[D_M, C^*, X]$ with respect to y yields

$$\widehat{U}_y\left[D_M, C^*\left(\tau^s, \tau^k, y, D_M, D_{M,0}, X\right), X\right]$$

$$= \begin{cases} v_{C^*}\left(\left[y^s(\tau^s, y, X) - \Delta_l(X) * D_{M,0}\right], X\right) * \left[1 - \left(\frac{\partial \tau^s}{\partial y} * y + \tau^s(y, X)\right)\right], & D_M = 0 \\ v_{C^*}\left(\left[y^s(\tau^s, y, X) - T(\tau^s, \tau^k, y, X) - \Delta_j(X) * \left(1 - D_{M,0}\right)\right], X\right) * \\ \quad \left[1 - (1 + \tau^k) * \left(\frac{\partial \tau^s}{\partial y} * y + \tau^s(y, X)\right)\right], & D_M = 1 \end{cases} \tag{4.12}$$

An increase in income always implies a higher level of utility for the individual because both expressions are greater than zero. However, if the derivative for $D_M = 0$ is larger than the derivative for $D_M = 1$, a rise in income will increase the disutility from paying church taxes and could eventually induce the individual to become a non-member.

In a progressive income tax system, a small y usally implies that $T(\tau^s, \tau^k, y, X)$ and $T_y(\tau^s, \tau^k, y, X) = \tau^k * \left(\frac{\partial \tau^s}{\partial y} * y + \tau^s(y, X)\right)$ are also small. The individual faces low costs of membership, so it is beneficial to be a church member when $U_{memb} > 0$. If y is significantly larger than zero, the individual faces two simultaneous effects, which I will call the "price effect" and the "income effect". I first examine the income effect. In order to see this effect more clearly, I assume for a moment that the amount of church tax T is fixed at k and does not depend on income.[75] The first derivative of the indirect utility function will then reduce to

$$\widehat{U}_y[D_M, C^*(\tau^s, k, y, D_M, X), X]$$

$$= \begin{cases} v_{C^*}(y^s(\tau^s, y, X), X) * \left[1 - \left(\frac{\partial \tau^s}{\partial y} * y + \tau^s(y, X)\right)\right], & D_M = 0 \\ v_{C^*}([y^s(\tau^s, y, X) - k], X) * \left[1 - \left(\frac{\partial \tau^s}{\partial y} * y + \tau^s(y, X)\right)\right], & D_M = 1 \end{cases} \tag{4.13}$$

Given that the marginal utility of income is decreasing, the derivative when $D_M = 0$ is smaller than when $D_M = 1$. The disutility from paying church taxes decreases with income and church membership becomes more likely as income rises. In simple terms, it "hurts less" to pay a given amount of church tax k when income is high compared to when it is low.

However, the "price effect" indicates that church taxes are not constant, but grow with income. Suppressing the "income effect" (y^s is assumed to be constant) and concentrating only on the "price effect" yields

[75] Transaction costs are disregarded in order to simplify the discussion.

$$\widehat{U}_y[D_M, C^*(T[\tau^s, \tau^k, y, X], y^s, D_M, X), X]$$
$$= \begin{cases} 0, & D_M = 0 \\ -v_{C^*}([y^s - T(\tau^s, \tau^k, y, X)], X) * \tau^k * \left(\frac{\partial \tau^s}{\partial y} * y + \tau^s(y, X)\right) < 0, & D_M = 1 \end{cases} \quad (4.14)$$

The higher someone's income is, the more expensive it is to be a church member. The price effect increases the disutility from paying church taxes and counteracts the income effect. This is true for regressive, linear and progressive tax systems, although the price effect is strongest in progressive systems.

Since price effect and income effect operate simultaneously one cannot analytically establish which prevails: the decrease in the marginal utility of income or the increase in costs of church membership. This question can only be determined empirically because it depends on the shapes of the tax scale and the individual's utility function.

The model clearly shows that it is necessary to control for both income and the amount of church tax when church membership decisions are examined. While an increase in church taxes – whether caused by changes in the tax rate or in income – always decreases the utility level of church members, an increase in income (not taking into account its effect on church taxes) tends to reduce the burden of paying for church membership.

Empirical research from the US finds that individuals with high income are among the most active contributors to religious communities (Donahue, 1994: 154; Brewer, Jozefowicz and Stonebraker, 2006: 393), which points towards the existence of the "income effect". At the same time, studies also find that the income elasticity of religious giving lies below one (see, for example, Donahue, 1994: 155; Hoge and Yang, 1994: 130-131; Zaleski, Zech and Hoge, 1994: 202-203; Lunn, Klay and Douglass, 2001; List, 2011: 165; see also the literature review in Hoge, 1994: 107). This could indicate that in the German church tax system – where church taxes grow progressively with income – an increase in income might result in a higher probability of disaffiliation. Thus:

> H 1: An increase in church tax payments increases the probability that the person disaffiliates when the increase is caused by a change in the church tax rate or the state income tax. An increase in church tax payments that is caused by a change in income will also raise the probability of disaffiliation when income is controlled for.

H 2: An increase in income decreases the probability that the person disaffiliates when the price of church membership is controlled for.

The results of the model differ in some respects from the results in Chapter 3. Both models agree that an increase in the church tax burden will *ceteris paribus* induce individuals to disaffiliate from the church. In Chapter 3 I identified an increase in the church tax rate as a cause of church disaffiliation. The present model makes it clear that there are different mechanisms behind increases in the church tax burden. First, the church tax rate itself, i.e. the additional tax to the income tax, can be changed. Second, the income tax rate can be changed while taxable income is constant and third, the definition of taxable income can be changed while income itself is constant.

In addition to the church tax burden, the model in Chapter 3 predicts that an increase in income will increase the probability of disaffiliation. The mechanism there was that a higher income leads to a higher church tax liability. Because of the particular form of the utility function in the model in Chapter 3, this leads to a reduction in utility. However, the present model sheds some doubts on this simple conclusion. I show that there are two effects working simultaneously. On the one hand, an increase in income results in higher church taxes, which reduces utility. On the other hand, when income increases, the marginal utility of income decreases. In other words, paying an additional euro of church tax is less "painful" for a richer person than for a poorer one. Which of the two effects prevails depends on the actual form of the utility function of the individual, which does not necessarily resemble a Cobb-Douglas function.

The present model also highlights the fact that personal characteristics X heavily influence the church membership decision. They have an effect on the benefits of church membership U_{memb}, the form of the utility function, the state income tax scale and the transaction costs of leaving and joining the church.

4.4.2 Demographic, socio-economic and regional variables influencing church membership

In this section I define individual characteristics X as demographic, socio-economic and regional variables and review the literature relating these variables to religiosity and church membership.

4.4.2.1 Demographic variables

One of the most important influences on processes of disaffiliation is **age**. There is unanimity in the literature that more young than old people disaffiliate. One possible explanation is that those individuals who have a low membership benefit U_{memb} drop out at a young age because this minimizes the costs and maximizes utility over the lifetime. Thus, the average membership benefits of the remaining members gradually increase and the average probability of disaffiliation decreases. Apart from this selection process, researchers discuss age and cohort effects. Iannaccone (1998: 1481) argues that individuals can accumulate "religious human capital" over the life-cycle and therefore become more efficient in producing religious goods as they age. A similar argument is brought up by Sandomirsky and Wilson (1990: 1218-1219), who state that once individuals have established their religious preferences, they are unlikely to change them again. In the terms of my model, this implies that the membership benefits of each member increase with age. However, most researchers attribute differences in religiosity between young and elderly individuals to cohort, rather than age effects (Te Grotenhuis and Scheepers, 2001: 602; Tilley, 2003: 273-274; Crockett and Voas, 2006: 569-572; Pollack, 2008: 175; Wolf, 2008: 115). Stolz (2010: 267) argues that in recent times individuals have gained more secular alternatives to religious goods. In particular, young individuals are used to these secular alternatives. In the context of my economic model, younger individuals today have on average a lower utility U_{memb} from church membership than the cohorts before them.

Empirical studies support these theoretical arguments. Brañas-Garza and Neuman (2004: 15) find that church attendance in Spain increases with age, while Schloz (2006: 56-57) reports that church commitment among Protestants in Germany steadily increases with age. Dubach (1993: 141-142) finds that in Switzerland the percentage of persons who have considered disaffiliating from the church steadily decreases with age. In particular, there is a sharp drop between the age groups 26 to 35 and 36 to 45. Studies on leaving the religious communitiy in Germany (Feige, 1976: 25-30; Eicken, 2006: 180; Eicken and Schmitz-Veltin, 2012: 88-89), Austria (Goujon et al., 2007: 255) and the Netherlands (Need and De Graaf, 1996: 96) find hump-shaped age profiles of church disaffiliation, which peak around age 19-20 in the Netherlands and around age 30 in Germany and Austria.[76] An exception is Borgloh (2012: 55) who finds a steady decline in the probability of disaffiliation with age. Nevertheless, I expect to find a hump-shaped profile, therefore my hypothesis is:

[76] The differences between these age spans might be explained by the fact that disaffiliation in the Netherlands does not require an official legal act (i.e. cause transaction costs), whereas it does in Germany and Austria.

H 3: The age profile of disaffiliations is hump-shaped and peaks around age 30.

Individuals with **children** are found to be less likely to leave their religion (Sherkat and Wilson, 1995: 1013). Men and women generally feel more committed to the church when they are parents (Engelhardt, von Loewenich and Steinacker, 1997: 221-222). Studies for the US and Britain show that having children usually has a small positive effect on church attendance, at least for women (De Vaus, 1982: 147-148; Sawkins, Seaman and Williams, 1997: 131; Tilley, 2003: 276). Stolzenberg, Blair-Loy and Waite (1995: 95-96) show that having children has a positive effect on the probability of church membership in the US. The effect is largest when children are of primary school age.

H 4: Having children or becoming a parent decreases the probability of disaffiliation.

Researchers often find that **women** are less likely to leave their religious communities than men (Sherkat and Wilson, 1995: 1013; Te Grotenhuis and Scheepers, 2001: 600-601). Gender differences in religiosity might be due to a stricter religious upbringing of girls, their higher willingness to conform to social norms or differences in tastes between genders. De Vaus and McAllister (1987: 472-473) also put forward the structural location theory as an explanation. First, women are usually more involved in child-rearing then men. If they want their children to receive religious education, they will automatically get in touch with religious organizations (see also Dubach, 1998: 37). Second, females show a lower labor force participation rate than males. Because labor participation provides "alternative sources of identity, interests, values, legitimations, and commitments" and leaves people with "less time to get involved in the church" (De Vaus and McAllister, 1987: 473), working might equally reduce religiousness for both genders. Azzi and Ehrenberg (1975: 35) put forward a similar argument: females often have lower wages than males, which means their opportunity costs of time spent on religious activities are lower. If couples or families make joint decisions about time use, it is rational for the husband to engage in the labor market and for the wife to produce religious commodities. Lukatis (1991: 126-129) finds that most of the differences in church commitment between Protestant men and women in Germany can be explained by labor force participation. While housewives, part-time employed and retired women are the least likely to give up their membership, there are hardly any differences in the propensity to disaffiliate between full-time employed men and women. Highly educated women are also found to have a higher propensity to leave the church than women with lower educational levels; they are even more prone to disaffiliate than their male counterparts (Engelhardt, von

Loewenich and Steinacker, 1997: 216-217; Dubach, 1998: 37-38; Brañas-Garza, García-Muñoz and Neuman, 2007: 22).

H 5: There are no significant differences in the probability of leaving the church between men and women who do not have children.

H 6: Having children or becoming a parent has a stronger negative effect on the probability of disaffiliation of women than men.

4.4.2.2 Socio-economic variables

Sherkat and Wilson (1995: 1004) find that adherents of stricter **denominations** are less likely to disaffiliate from the church. In the German context, the Catholic Church is stricter than the Protestant Church with respect to membership and participation rules. Therefore the perceived costs of leaving the Catholic Church are higher (Birkelbach, 1999: 139). This is clearly reflected in disaffiliation rates of Catholics and Protestants in Germany, which have been running parallel, but at a significantly higher level for Protestants (Pollack, 2001: 1053-1054).

Catholics are often found to hold stronger beliefs and attend church more regularly than Protestants (Campiche, 1993: 80-81; Cameron, 1999: 446; Köcher, 2009: 802, 812). They also manifest a lower propensity to question their church membership (Institut für Demoskopie Allensbach, 1992: 5-7; Dubach, 1993: 139-140). This might be due to the different character of these denominations: Catholicism promotes a more church-related form of religiousness, while Protestantism stresses individual piety (Dubach, 1998: 29). I therefore pose the following hypothesis:

H 7: Catholics are less likely to leave the church than Protestants.

Some research suggests that financial considerations such as payment of church taxes are less important in the church membership decisions of Catholics than of Protestants (Institut für Demoskopie Allensbach, 1992: 24-25; Birkelbach, 1999: 149-150). I therefore test the hypothesis:

H 8: The effect of church taxes on disaffiliation is stronger for Protestants than for Catholics.

A few studies also point towards noticeable differences in the church commitment, church membership rates, and propensity to disaffiliate of individuals with different professions (for Germany, see Feige, 1976: 74-79; Hanselmann, Hild and Lohse, 1987: 144-145; for research

on Switzerland, see Campiche, 1993: 74, 80; Dubach, 1998: 48-51). Unfortunately, I cannot observe the individual's profession. However, I try to get a rough estimation by including the individual's **main source of income** derived from the income tax statement. I distinguish (i) income from agriculture and forestry, (ii) income from business activity (including income from unincorporated business enterprise and from self-employed activities), (iii) wage income, (iv) capital income and (v) other income sources. Earlier research has shown that individuals working in high management positions and the self-employed have a comparably low membership rate and a high propensity to disaffiliate (Hanselmann, Hild and Lohse, 1987: 144; Dubach, 1998: 49-51), while people working in agriculture show particularly high church membership rates and church commitment and wage earners take an intermediate position (Campiche, 1993: 74, 80; Dubach, 1998: 48-49). Possible explanations for the connection between profession and church membership are differences in the educational level that professions require and differences in the social environment of individuals with different professions (Dubach, 1998: 48-49).

> H 9: Individuals receiving income mainly from agriculture have a below average probability of disaffiliation, while individuals receiving income from business activity have an above average probability of disaffiliation.

4.4.2.3 Regional variables

Religiousness differs between **regions**, especially in Germany. I have already mentioned that East Germany is far more unchurched than West Germany. In East Germany in 2009 about 22 % of the population belonged to one of the two major churches, while the share of church members was still around 75 % in West Germany (Köcher, 2009: 814). In West Germany, the decision against church membership is perceived as an intentional divergence from the tradition whereas it means being in the mainstream in the former GDR (Pittkowski, 2006: 91).

Although Christians constitute a minority in East Germany, church commitment among the remaining church members is not particularly high. In fact, Pollack (2000: 20-24) argues, based on data for 1991, that both religious participation and belief are not higher in East Germany than in West Germany. Data on church disaffiliation rates in East and West Germany show that they have leveled off at rather similar values since the late 1990s. However, more recent data for members of the Protestant church show that there are more individuals with high and very high church commitment in East Germany than in West Germany, although the distribution of commitment in both parts of the country equals a normal distribution. Only those individuals who have experienced being a minority in the

GDR show an above-average church commitment. (Schloz, 2006: 54-55) Some research suggests that among Protestants the acceptance of the church tax in general and of the personal tax amount is higher in East Germany than in West Germany (Huber, Friedrich and Steinacker, 2006: 460-461).

Although the existing research is not completely consistent, I pose the following hypotheses:

H 10: Church membership decisions do not differ significantly between East and West Germany.

H 11: The effect of church taxes on disaffiliation is slightly smaller in East Germany.

Surveys also suggest that gender differences with respect to church attendance and church commitment are small or non-existent in East Germany (Eiben, 1992: 97-98; Engelhardt, von Loewenich and Steinacker, 1997: 301-304). However, Kecskes (2000: 98) finds that gender does play a significant role in the church membership decision in East Germany. Given the limited and contradictory evidence for the effect of gender on the decision to leave the church, I will not pose a hypothesis here.

Another aspect of the regional perspective is differences between **rural and urban** areas. Steckhan (1991: 231-235) shows that church members in large cities are significantly less committed to the church, but highlight the role of the church as a provider of help for the poor, old and sick, whereas people living in rural areas quote traditional and spiritual reasons for church membership more often. Pickel (2011: 59-60) uses recent data from Germany to show that in large cities there are significantly more people without church membership than in rural areas and small cities – the pattern is found both in East and West Germany. For Switzerland, Dubach (1998: 61-63) reports that there are large differences in church membership between urban and rural areas and that these differences cannot be fully explained by the structure of the population, such as average education or type of employment. He concludes that living in a city has an independent effect on the individual relation to religious communities. Since opportunities for secular leisure consumption are limited in rural areas (Steckhan, 1991: 245-246), people living there can be expected to spend more time with religious activities. The social pressure motive of church membership might also be more important in rural areas since people are better informed about the private matters of their neighbors (Pickel, 2011: 60). In the terms of my model, I expect that the benefits of church membership are higher in rural areas and are therefore more likely to outweigh the costs.

H 12: Individuals living in large cities are more likely to leave the church than persons in rural areas.

A regional aspect that has so far been neglected in the German discussion is the importance of **mobility**, which I define as changing the place of residence. Stark and Finke (2000: 250-251) note that in areas in the US where mobility is high, it is difficult for voluntary organizations such as churches to maintain their membership. Richter and Francis (1998: 67-70) observe a similar phenomenon in the United Kingdom. They argue that changing places means looking for a new church or congregation, getting to know other congregation members and establishing ties. This is resource and time-consuming, especially if individuals move several times. A study for Switzerland (Dubach, 1998: 54-56) reveals that people who moved within the last five years are less likely to be church members and the percentage of non-members is higher among individuals moving in from abroad or from another canton than for people moving within the same canton. Feige (1976: 198-199) discusses the possibility that church disaffiliation might coincide with mobility. Since church disaffiliation is a formal act in Germany, the hurdle to take action could be lower for people who move because they need to contact the local administration anyway. Feige neither finds evidence for nor against the hypothesis that mobility increases the propensity to opt out of church. Lois (2011b: 99) investigates how events during the life cycle affect participation in church services in Germany. He finds that moving from East to West Germany tends to increase participation, while moving from West to East has no effect. However, it should be noted that changes in participation need not coincide with changes in the propensity to disaffiliate. Despite the moderate importance that German research assigns to regional mobility, I pose the following hypothesis:

H 13: Individuals who are mobile have a significantly higher disaffiliation rate than individuals who do not move.

4.5 Data

4.5.1 The Taxpayer Panel

The research questions will be answered empirically, using the Taxpayer Panel, a 5 % stratified random sample of all individual tax returns in Germany for the years 2001 to 2006 provided by the German Federal Statistical Office. The data set includes all information stated in the income tax returns, such as personal details, income from different sources (wage income, income from business activity and capital income), as well as tax exemptions. For the purpose of this chapter, the most important variables are denomination (Roman Catholic, Protestant, no denomination, other) as registered by government authorities, church taxes paid, gender, civil status, age, number of children, income, taxable income, sources of income and federal state of residence. The data set also allows calculating hypothetical church tax payments for people who are not church members.

The data set contains information on about 930,000 taxpayers, of which 23.5 % are single males, 18.5 % are single females and 58 % are married couples. Roughly 14.8 % of the taxpayers live in East Germany. The sample is representative of high income earners but excludes most of the individuals who live on state transfers as well as the majority of retirees and a significant proportion of individuals and households that have only wage earnings (Bach, Corneo and Steiner, 2009: 308) because the latter often do not file an income tax return.

There are some further drawbacks to this data set. First, it does not include some potentially important variables such as the strength of Christian belief, education, religious upbringing, rurality of place of residence or citizenship. Second, it only permits the study of Christian denominations, because data on other denominational memberships (e.g. Muslim) are not recorded. However, it is likely the most accurate and comprehensive account of formal church membership and church tax payments available for Germany.

The Taxpayer Panel data set is a stratified sample of individuals, which means that the population is divided into groups, so-called strata, and from each group individuals are randomly drawn. In contrast, in a simple random sample the whole population would be one stratum from which the sample is drawn. The stratification of the data and the sampling weights of each stratum are provided by the Federal Statistical Office. Strata are generated by splitting the data set according to federal state *("Bundesland")*, tax assessment scheme (single or joint assessment), main source of income (income from business or agriculture and

forestry; wage income; other types of income), average overall income (seven classes) and variation of average overall income. Some strata are collapsed for reasons of data security or because the number of observations in the strata is too low. Altogether, there are 2441 strata. From each stratum, a random sample is drawn with sampling fractions reaching between 2 % and 85 %. (Destatis, 2010)

4.5.2 The sample

The regression is not run on the complete sample. There are two large restrictions. First, I only use data for unmarried individuals and second, I only look at individuals who were church members at the beginning of the period. The first restriction is implemented by including only individuals who choose "residual tax assessment" (*"übrige Veranlagung"*, where variable ef18[77] takes on the value "3") in both 2001 and 2005. This type of assessment is chosen when individuals are not married; it also excludes widows and widowers whose spouses died in the previous year. Married individuals are excluded because the calculation of church taxes depends on the income and church membership status of both spouses. In addition, they have a different choice set than single individuals because one would expect that the decision about church membership is, at least to some extent, taken jointly. Church disaffiliation of one partner, while the other stays a member, is a feasible and – according to anecdotal evidence – attractive choice possibility. I also exclude married individuals who choose "separate assessment". In this case, church taxes are calculated as if the individual was single, however, one would still expect that church membership decisions are also influenced by the spouse. For the same reason, I exclude individuals who marry in the respective year and choose a special form of the single assessment scheme *("besondere Veranlagung im Jahr der Eheschließung")*. Furthermore, recently widowed individuals are excluded because the joint taxation scheme applies to them, which would cause a large effort in calculating their church taxes, and in addition their church membership decision might be strongly influenced by the recent death of the spouse rather than the variables I control for. However, both recently widowed individuals and married individuals who choose individual assessment or special assessment make up only a small part of the data set such that the sample is still large.

The second restriction of the data set – the individual needs to be a church member in 2001 – is due to the research question I ask. I am interested in church disaffiliations only, therefore my sample consists of individuals who are church members in the first year of observation and I look at their decisions over time.

[77] Variable names refer to the variables included in the Taxpayer Panel.

Finally, I exclude all taxpayers for which any of the relevant dependent or independent variables are missing. This also applies to all taxpayers whose average yearly overall income *("Gesamtbetrag der Einkünfte")* for the period 2001-2006 was above 150,000 euro because for them the information on the federal state of residence is missing due to data security issues.

Additionally, I check the data for consistency over the years and correct or delete some observations. First, in some cases individuals are recorded as changing their gender several times during the six year period. In all of these cases, the gender that is stated in the data for the year 2005 is assigned to all observations for the respective individual. Second, some individuals are recorded as both affiliating and disaffiliating from the church during the six years under investigation. This is possible, but rather unlikely. The problem frequently occurs for taxpayers living in the city state of Hamburg where – according to information from the Federal Statistical Office – there were problems with recording the church membership of individuals, which resulted in implausibly high numbers of church affiliations and disaffiliations. In order to avoid biased results due to data inconsistencies, all individuals with more than one change in church membership status are excluded from the sample. Third, some individuals are reported as not being church members, although they have positive church tax payments. Examination of the data shows that this problem usually appears in years when people disaffiliate from the church. Therefore individuals with positive church tax payments are re-coded as church members. Fourth, some tax files include the information that individuals are taxed according to the joint taxation scheme *("Splittingtabelle")* although they choose the "residual tax assessment" which is applicable exclusively for singles. This is obviously an error in the data, therefore I apply the restriction that the taxpayer is taxed according to the "single assessment scheme" (variable ef19 takes on the value "1").

From the foregoing discussion it should be clear that what I look at is not a random sample of the German population, nor is it a random sample of church members. One has to keep in mind that I can only consider individuals who have not disaffiliated from the church before 2001. This subpopulation may not be a random group of all individuals who were at some point in time a church member. Such a sample is called "truncated", i.e. the sample is selected based on the variable of interest, in my case church membership (see Greene, 2008: 867-868). In addition, I only look at unmarried individuals who might differ from married individuals in their behavior concerning church disaffiliation. The regression coefficients can therefore only

be interpreted with respect to the sample, i.e. unmarried church members in 2001, but not with respect to the general population.

4.5.3 Dependent variable: Church disaffiliation

The dependent variable in the estimations is church disaffiliation. Church disaffiliation is a binary variable measured as the difference in church membership status between 2001 and 2006. Since my sample only consists of individuals who were church members in 2001, there are two possibilities: either they are church members in 2006, in which case the dependent variable is 0, or they leave the church, in which case the dependent variable is 1.

Church membership is measured with the variable ef13. This variable includes a large list of denominations which are combined in 4 groups: Catholic, Protestant, other denomination, no denomination. The assignment to these four groups follows a scheme provided by the Federal Statistical Office. The "Protestant" group includes all members of all churches who are part of the "Evangelical Church of Germany" *("Evangelische Kirche in Deutschland")*. The "other denomination" category includes denominations which levy church taxes on their members and have them collected via state tax authorities. These are the Old Catholic Church *("Altkatholische Kirche")*, some Religious Humanist communities *("Freireligiöse Gemeinden")* and some Jewish communities. All individuals who are in none of the three aforementioned groups belong to the "no denomination" group. It is important to notice that the separation in these four groups does not reveal anything about the religious convictions of the individuals. In particular, it is not valid to assume that individuals in the last group are not devout. Muslim and Buddhist communities, Jehovah's Witnesses, Protestant non-denominational churches *("Freikirchen")* and many others are either not organized in a way that would allow them to confer the collection of taxes from their members on the state or they do not utilize this right.

In my research, I am specifically interested in the members of the two large churches in Germany – the Catholic Church and the Evangelical Church in Germany. Therefore I exclude from the sample all individuals who are members of the "other denomination" group in 2001 and/or 2006. However, in order to account for possible inconsistencies in the data, I count all individuals as church members who are recorded as "no denomination" but who have to pay a

positive amount of church tax.[78] Whether someone pays church taxes is evaluated according to the assessed church tax (*"festzusetzende Kirchensteuer"*, variable c66104).

I measure the church membership status in 2006 and contrast it with 2001, even though all other variables are measured as differences between 2001 and 2005. The reason is that I can only see a church disaffiliation which happened in 2005 in the data set of 2006 because individuals who were church members for some part of the year are recorded as church members for the whole year and become non-members in the next year. This definition of church disaffiliations ensures that the data set includes disaffiliations in the year 2005.

4.5.4 Price of church membership

4.5.4.1 Calculation of the price of church membership

The price of church membership is mainly determined by the amount of church tax a church member has to pay. As was already mentioned, the church tax is an additional tax to the income tax. That is, in order to calculate the church tax, one has to know the taxable income, apply the income tax scale to receive the income tax and then apply the church tax scale to calculate the amount of church taxes.

The actual amount of church taxes paid each year is included in the data set, however, it is only available for church members. Since I am also interested in knowing the hypothetical church tax that non-members would have to pay if they were members, I need to estimate the church tax payments of non-members. In order to guarantee that possible mistakes in the calculation do not lead to systematic differences between the reported church tax for members and the calculated church tax for non-members, I calculate the tax for both groups and use the reported tax amounts as a benchmark to test the quality of the estimations.

However, the church tax a church member pays (and the amount the religious community receives) does not correspond to the actual "price" of church membership which I am interested in. The reason is that church taxes paid can be deducted as special expenses and reduce the taxable income, the income tax and the solidarity surcharge. Consequently, I define the price of church membership as the church tax less reductions in income tax and solidarity

[78] The reason is, first, that the assessed church tax in the data appears to be more reliable than the variable indicating denomination, therefore including all taxpayers who pay church tax in a specific year helps to ensure that no church members are erroneously excluded from the sample. Second, for the individuals in the final sample this approach ensures a conservative measurement of church disaffiliation because both the variable indicating the denomination and the variable measuring church tax payments need to indicate that someone is not a church member in order to be considered a non-member in my study.

surcharge caused by the deductibility of church taxes as special expenses. The deductible amount of church tax is not the final church tax liability of the year, instead it is the amount actually paid during the year, either as an additional tax to the payroll tax or together with advance payments on the income tax. Again, the deductible amount is given for church members, but missing for non-members. In line with the above I estimate the deductible amount of church tax for all individuals. The procedure for calculating the price of church membership is the following: in step 1, I calculate the deductible amount of church taxes; in step 2, I calculate the church tax itself; in step 3, I calculate how much a taxpayer saves in income tax and solidarity surcharge when he or she deducts the estimated amount of church tax paid as special expenses. The price of church membership is the estimated church tax less the reduction in income tax and solidarity surcharge. In section C.1 in Appendix C I describe the calculation of the price of church membership on the basis of steps one to three in more detail. In addition, I discuss factors that prevent the exact calculation of the price. In Appendix B I give a detailed overview over church tax regulations in each Land in Germany. The Länder differ with respect to the church tax rate (which is 8 % in Bavaria and Baden-Württemberg and 9 % in all other Länder), the existence and amount of the minimum church tax and the existence and amount of the maximum church tax.[79] In the calculation of the price of church membership all regulations are accounted for.

4.5.4.2 Variables measuring the price of church membership included in the estimations

In the basic estimation I include three measures related to the price of church membership: a dummy variable indicating whether the taxpayer has to pay a positive price for church membership *("Dummy Price 2001 positive")*, the price of church membership in 2001 *("Price 2001")*, and the change in the price of church membership between 2001 and 2005 *("Δ Price")*. The price change is calculated by subtracting the price in 2001 from the price in 2005. The price of church membership is deflated with the consumer price index for Germany with the base year 2005. Data on the consumer price index is taken from the Federal Statistical Office (Statistisches Bundesamt, 2010: 522). The price is measured in units of 100 euro, i.e. when interpreting regression results the coefficients give the effect of a change in price by 100 euro, which is a considerable but conceivable amount.

As a robustness tests, I also use the church tax in 2001 *("Church tax 2001")*, a dummy indicating whether the individual pays church tax in 2001 *("Dummy Church tax 2001 positive")*, and the change in church tax between 2001 and 2005 *("Δ Church tax")* in the

[79] In some cases these regulations even differ between denominations or regional churches within a Land.

estimations. The church tax is the tax calculated in step 2 above (for details on its calculation, see Section C.1.2 in the appendix).

4.5.4.2.1 Causes for changes in the price of church membership

I attribute the changes in the price of church membership to different sources, which were already discussed in the model in Section 4.4.1: (a) changes in the church tax scale, (b) changes in the state income tax scale, (c) changes in the definition of taxable income, (d) changes in income itself and (e) changes in the tax-relevant behavior of the individual (e.g. making donations and declaring them as special expenses). While (a) is in the sphere of influence of religious communities, (b) and (c) are caused by the government and (d) and (e) are due to the individual. In what follows, I separate (a) from the other four effects. I start by determining the taxable income for the calculation of the church tax in 2005. Then I apply the income tax scale of 2005 in order to calculate the income tax, which is in turn the tax base for the church tax. Now I calculate the church tax (resp. the price of church membership) twice: first, with the church tax laws the individuals faced in 2001 and second, with the church tax laws the individuals faced in 2005. The difference between these two numbers is the change in the price of church membership that can be attributed to changes in church tax regulations *("Δ Price – church")*. Since there have been very little changes in the church tax regulations of each single Land, most of the non-zero values can be attributed to individuals who move to a Land with different church tax regulations.[80] The method of calculation ensures that this variable is zero if the person has not moved or converted and there have been no changes in the church tax regulations of his or her Land. An overview of church tax regulations in each Land and for each year can be found in Appendix B.

The change in the price of church membership that is caused by changes in state income tax regulations and/or individual attributes *("Δ Price – state")* is calculated as a residual, taking the difference between the price in 2001 (that has been derived from the income of 2001) and the hypothetical price that was calculated with the 2005 income and the 2001 church tax laws.

There is another possibility to calculate the shares of the changes in the price of church membership that can be attributed to church tax laws and income tax laws/individual attributes. The second way of calculating the variables and the advantages and disadvantages of both approaches are discussed in Section C.2 in Appendix C. However, in my empirical estimation I only use the first way of calculating the variables.

[80] Another possible reason for the change in church tax regulations is a religious conversion between Catholicism and Protestantism, since regulations sometimes differ between those two religious communities.

It would be interesting to see if changes in the price of church membership caused by state interventions (income tax scale and definition of taxable income) and changes caused by the individual him- or herself (changes in income or behavior) affect the probability of disaffiliation differently. However, such research is very hard to implement given the data available. Income and taxable income differ substantially and not every change in income translates into a change in taxable income (and, in the next step, church taxes) and vice versa. In addition, there have been plenty of changes in the definition of taxable income in the time period under consideration, which make it almost impossible to determine the taxable income a person would have had in 2001 if his or her income had been the income of 2005.[81] Sometimes it is also difficult to separate the effects of changes in the definition of taxable income and changes in the tax-relevant behavior of individuals, since changes in the former are meant to trigger changes in the latter.[82]

4.5.4.2.2 Positive and negative changes in the price of church membership

I am also interested in finding out whether individuals react differently to increases and decreases in the price of church membership. In line with the theoretical model developed in Section 4.4 one would expect that an increase in price raises the probability of disaffiliation. In contrast, a decrease in price should have no effect since *ceteris paribus* it only improves the cost-benefit-ratio, but does not cause a reaction of the individual.[83] In order to test this hypothesis, I first introduce a dummy variable which indicates whether the price of church membership has increased, with constant and decreasing prices of church membership as the reference category (variable *"Dummy Price increase"*). Second, I create separate variables that measure the positive resp. negative change in the price of church membership. The variables *"Δ Price positive"* is equal to the change in the price of church membership (variable *"Δ Price"*) when the price increases (i.e. when the dummy variable *"Dummy Price*

[81] Consider the following example: The calculation of the taxable share of pensions changed between 2005 and 2001. In 2001, the share depended on the age when the person first received the pension payment. This share was on average around 30 % and is given in the data set. In 2005, 50 % of pension income was taxable. For most pensioners, this meant an increase in their taxable income and consequently in their church tax payments. If I wanted to separate the effects of an increase in the pension itself (an increase in income) and an increase in the taxable share of pension income (a change in the definition of taxable income) on the church tax paid, I would have to take the amount of the pension in 2005 and apply the laws of 2001. However, it would then be necessary to know the taxable share of the pension according to the old regulations, which is not given in the data set for pensions drawn in 2005.

[82] In 2002, the German government introduced a pension reform and now grants a tax allowance to individuals who take out a private pension insurance. This allowance reduces the taxable income of the taxpayer and thereby the church tax payments. However, these reductions are both due to the change in the definition of taxable income (introduction of a new allowance) and the behavior of the individual (taking out a private pension insurance).

[83] A possible reaction to a decrease in the price of church membership is church (re)affiliation, which I do not observe in my sample that consists of individuals who were church members in 2001.

increase" takes on the value one) and zero otherwise. Similarly, the variable *"Δ Price negative"* is equal to the change in the price of church membership when the individual faces a constant or decreasing price (i.e. when the dummy variable *"Dummy Price increase"* takes on the value zero) and zero otherwise. As a robustness check I perform the same estimation again with the church tax instead of the price of church membership. The corresponding variables are called *"Dummy Church tax increase"*, *"Δ Church tax positive"* and *"Δ Church tax negative"*.

4.5.5 Income

4.5.5.1 Theoretical considerations

In the income tax law there are various definitions of income, in particular the sum of income *("Summe der Einkünfte")*, the overall income *("Gesamtbetrag der Einkünfte")* and the taxable income *("zu versteuerndes Einkommen")*. Such definitions are inspired by the "source theory" *("Quellentheorie")* of income taxation which states that only income deriving "**regularly** from **permanent sources of income**" (Blankart, 2001: 256 [my own translation, emphasis in original]) should be taxable. However, in my empirical research I apply an "economic income definition" (Merz, 2001: 29 [my own translation]) that is more in accordance with the Schanz-Haig-Simons income, which measures the sum of the consumption of the period and the change in net wealth (Blankart, 2001: 257). I follow the argument of Merz (2001) who states that for economic considerations one should find a definition of income that describes the "available income" (Merz, 2001: 29 [my own translation]). Given the data available in the Taxpayer Panel, this is possible only to a limited extent. In this chapter I apply the definition of economic income given in Merz (2001) and Merz and Zwick (2001). I also draw upon Kalusche (2006) who connects the definition of Merz with the specific variables given in the Taxpayer Panel data set. A positive side effect of the use of an economic concept of income instead of one of the tax-related definitions of income is that the correlation of income and price of church membership is weaker, since the church tax is highly dependent on the income tax while there are some significant differences between economic income and taxable income. This reduces the problem of multicollinearity in my regressions.[84]

[84] Besides the differences between economic income and taxable income there are some further arguments why income and price of church membership are not perfectly correlated in my study. First, the church tax grows progressively with taxable income; therefore income and church tax are not linearly dependent. Individuals with the same taxable income also differ in the amount of church taxes they have to pay when they have a different number of children. Furthermore, church tax regulations vary between Länder: the tax rate as well as maximum

4.5.5.2 *Implementation*

The starting point for the calculation of economic income is the overall income *("Gesamtbetrag der Einkünfte")*. The economic income is calculated according to the schedule in Figure 4.1.

My approach differs from Merz (2001), Merz and Zwick (2001) and Kalusche (2006) in that I start with an aggregate income (in this case, the "overall income") and then go back to each type of income and look at the necessary corrections, while the above authors analyze the composition of each type of income, sum up the relevant individual parts of income and arrive at the "corrected" aggregate income.

In Section C.3 in Appendix C I explain each item in Figure 4.1 in detail. In addition, I discuss the problems and shortcomings of this definition of economic income.

Figure 4.1: Calculation of economic income

Overall income *("Gesamtbetrag der Einkünfte")*	
+	Reduction for single parents (*"Entlastungsbetrag für Alleinerziehende"*, c65319)
+	Reduction for aged persons (*"Altersentlastungsbetrag"*, c65321)
+	Reduction for income from farming (c65336)
%	Income tax due *("Festzusetzende Einkommensteuer")*
%	Solidarity surcharge *("Solidaritätszuschlag")*
+	Income under the "exemption with progression" rule (*"Einkommen unter Progressionsvorbehalt"*, c66200+c66202+c66204)
+	Child benefit *("Kindergeld")*
+	Tax-exempt part of pensions
+	Tax-exempt capital gains (*"steuerfrei bleibende Veräußerungsgewinne"*, c65112+c65127+c65149)

tax rates and minimum taxes vary, therefore two individuals who have the same taxable income but live in different regions sometimes pay a different amount of church taxes.

+	Deduction for income from agriculture and forestry (*"Freibetrag nach § 14a Abs. 4 EStG"*, c65110)
+	Deduction for pensions of civil servants (*"Freibeträge für Versorgungsbezüge"*, c65167)
+	Savings allowance (*"Sparerfreibetrag"*, c65227)
+	Deductions for other income (*"Versorgungsfreibetrag bei Einn. i.S.d. § 52 Abs. 34c S. 1 EStG"*, c65289, and *"Versorgungsfreibetrag zu Abgeordnetenbezügen"*, c65295)
%	Alimony to a separated or divorced partner (*"Unterhaltsleistungen nach § 10 Abs. 1 Nr. 1 EStG"*, c65401)
%	Extraordinary financial burdens (*"Abzugsbetrag § 33 [Außergewöhnliche Belastungen]"*, c65469)
%	Extraordinary financial burdens for professional training of own children (*"Ausbildungskosten (§ 33a Abs. 2 EStG)"*, c65472)
%	Extraordinary financial burdens for child support (*"Unterhaltsaufwendungen (§ 33a Abs. 1 EStG)"*, c65475)
+	Pensions-savings grant (*"Altersvorsorgezulage"*, c65895)
%	Employee savings premium (*"Festgesetzte SPZ [Sparzulage]"*, c66515)
+	Tax-exempt half-income (*"Hinzurechnungsbetrag stfr. Halbeinkünfte"*, c65885)
=	Economic income

4.5.5.3 Income variables included in the estimations

In all estimations I use two variables related to income: first, economic income in 2001, and second, the change in income between 2001 and 2005. The change in income is calculated by subtracting the income in 2001 from the income in 2005. Income is deflated with the consumer price index for Germany using the base year 2005. Data on the consumer price index are taken from the Federal Statistical Office (Statistisches Bundesamt, 2010: 522). Finally, income is divided by 1,000.

4.5.6 Demographic, socio-economic and regional variables

4.5.6.1 Age

Respondent's age is derived from the date of birth given in variable ef43 *("Geburtsdatum –A–")*.[85] The age of the taxpayer is calculated as the difference between the year of birth and the year of the tax return. In the estimations I use the age of the taxpayer in 2001. Instead of treating age as a continuous variable, I define six age groups: below 25, 25 to 34, 35 to 44, 45 to 54, 55 to 64 and above 64. The age groups are chosen such that the number of individuals in each group is sufficiently high. It also assists in testing the hypothesis that the probability of disaffiliation peaks around the age of 30 and it assures that the oldest age group consists mainly of pensioners.

4.5.6.2 Gender

The gender of the person filing for tax return is given in variable ef8 and can be either male or female. For married couples, the gender is per definition male. Inspection of data for singly assessed individuals revealed that there are some data inconsistencies with respect to gender. Therefore the gender assigned to the individual in the estimation is the gender given in 2005. From the inspection of the data it appears that the information on gender given in 2005 and 2006 is more reliable than that for earlier years.

4.5.6.3 Children

The number of children of the taxpayer is derived from variable c65748 *("Zahl der Kinder (ZK+ZHK)")*. § 32 ITL defines the term "child". Both an individual's own children and foster children are counted as children:

- until they reach age 18
- until they reach age 21 if they are registered as unemployed
- until they reach age 27 if they have not yet finished professional training
- if they are handicapped such that they cannot sustain themselves.

In each case, children need to have an income below the basic personal allowance *("Grundfreibetrag")* in order to be included in the tax return of their parents.

I account for children by looking at the number of children in 2001 and changes in the number of children between 2001 and 2005. The variable *"Children"* is discrete with 6 mutually

[85] This is usually an 8-digit number from which the last 4 digits are extracted. If the resulting number is larger than 2006 or smaller than 1891, I treat the year of birth as missing.

exclusive categories. The first category comprises individuals who neither have children in 2001 nor in 2005. They are termed "childless". Note that this can either mean that the taxpayer does not have children at all or that he or she has children that have surpassed the age limits or the income limits listed above. The second category is individuals who are parents in 2001 and still have the same number of children in 2005. I assume that in the majority of cases the same children are counted in both years, although I cannot exclude the possibility that within that period of time one child has surpassed the age or income limits while the taxpayer has given birth to another child or has taken in a foster child. In the third and fourth category there are individuals whose number of children increases between 2001 and 2005. In category 3 there are taxpayers who are childless in 2001 but have at least one child in 2005, while in category 4 there are taxpayers who are parents already in 2001 and whose number of children increased by 2005. The final two categories comprise individuals whose family size decreases. In category 5 there are individuals who are parents in both years, but the number of children decreases between 2005 and 2001, while in category 6 there are individuals who are parents in 2001 but are considered childless with respect to income tax in 2005.

4.5.6.4 Main source of income

The main source of income is a discrete variable with 5 different values. I look at the total income from five different sources: income from agriculture and forestry, income from business activity, wage income, capital income and other sources of income.

Income from agriculture and forestry is the sum of income from agriculture and forestry (variable c65101) augmented by deductions for income from agriculture and forestry (variable c65110) and tax-exempt capital gains.

Income from business activity is the sum of income from unincorporated business enterprises (variable c65121) plus the sum of income from self-employed activities (variable c65141), augmented by tax-exempt capital gains (variables c65127 and c65149).

Wage income is the sum of wage income (variable c65161) plus deductions for pensions of civil servants (variable c65167).

Capital income is the sum of capital income (variable c65221), augmented by the savings allowance (variable c65227), plus the sum of income from rent and leasing (variable c65241).

Other income comprises the sum of other income (variable c65261) and the tax-exempt part of pensions and is augmented by deductions (variables c65289 and c65295).

I define as the main source of income the income source that is larger than any of the other sources. The variable refers to income in 2001.

4.5.6.5 Denomination

Denomination is a binary variable with "Protestant" as the reference category ("Denomination" takes on the value "0") and "Catholic" as the second variable value ("Denomination" takes on the value "1"). Individuals who have a positive assessed church tax, although they have no denomination according to variable ef13 *("Religion –A–")* are also included in the reference category (see Section 4.5.3 for the motivation for this decision). Denomination is measured in 2001. I do not account for the eventuality that an individual changes his or her denomination after 2001 before disaffiliating from the church.

4.5.6.6 Region of residence and mobility

Information about the region of residence in each year is taken from variable bl *("Bundesland")*. From this variable I can derive the Land where the individual lives in each year. I include in the estimations both the Land where the individual lives in 2001 and mobility between 2001 and 2005. The region of residence is measured by including a dummy variable for each Land (with North Rhine-Westphalia as the reference category). In the absence of more detailed information[86] this dummy variable is intended to capture regional differences in attitudes towards church membership and church disaffiliation, such as social pressure to be a church member, public goods provided by the church or the importance of religious organizations in providing private benefits for the members, e.g. in the form of social networks. In addition, the dummy variable helps to control for differences in the transaction costs of church disaffiliation, such as the authority that accepts declarations of church disaffiliations and the fees that need to be paid.

Since the data set only includes information about the Land of residence, but not the city, I can measure mobility only as mobility between Länder. However, this is a minor problem since earlier research (Dubach, 1998: 54-56) suggests that inter-regional mobility has a larger effect on church disaffiliations than intra-regional mobility. Even if my reference group of "stayers" actually involves a considerable percentage of individuals who have moved within a Land, the effect of inter-regional migration should still be measurable. Mobility is measured

[86] Such information could be the degree of urbanity/rurality and the religious landscape of the place of residence.

by comparing the Land where an individual lives in 2001 with the Land where he or she lives in 2005. I build a discrete variable with five different values: individuals who live in the same Land in 2001 and 2005, individuals who move within East Germany, individuals who move within West Germany, individuals who move from East to West and those who move from West to East. West Germany covers the eight West German territorial states as well as the city states of Hamburg and Bremen. East Germany comprises the five East German territorial states and the city of Berlin.

4.5.7 Summary statistics

Table 4.1 provides summary statistics for the complete sample and for the two sub-samples of males and females. Minimum and maximum values are not reported since this information is considered confidential and thus is not provided to the researcher by the Federal Statistical Office. Data are weighted with the sampling weights provided by the Federal Statistical Office.

Table 4.1: Summary statistics for the complete sample and for males and females separately

	Complete sample		**Subsample males**		**Subsample females**	
	mean	**std. dev.**	**mean**	**std. dev.**	**Mean**	**std. dev.**
Church disaffiliation	0.095	0.293	0.105	0.307	0.083	0.276
Price of church membership						
Price 2001 (in 100€)	1.83	21.68	2.02	22.22	1.64	21.03
Dummy Price 2001 positive	0.704	0.457	0.709	0.454	0.698	0.459
Δ Price (in 100€)	0.50	22.79	0.62	24.45	0.37	20.83
Δ Price – church (in 100€)	0.0001	0.34	---	---	---	---
Δ Price – state (in 100€)	0.50	22.80	---	---	---	---
Dummy Price increase	0.524	0.499	0.535	0.499	0.512	0.500
Δ Price positive (in 100€)	1.80	26.13	2.09	29.97	1.49	20.82
Δ Price negative (in 100€)	-0.93	16.95	-1.07	14.40	-0.79	19.21

Church tax						
Church tax 2001 (in 100€)	3.30	30.30	---	---	---	---
Dummy Church tax 2001 positive	0.673	0.469	---	---	---	---
Δ Church tax	0.40	30.11	---	---	---	---
Dummy Church tax increase	0.511	0.500	---	---	---	---
Δ Church tax positive (in 100€)	2.47	30.46	---	---	---	---
Δ Church tax negative (in 100€)	-1.77	25.92	---	---	---	---
Income						
Income 2001 (in 1,000€)	21.170	82.503	21.165	86.504	21.176	77.948
Δ Income (in 1,000€)	1.799	111.881	2.364	126.508	1.217	93.437
Age						
Below 25	0.193	0.395	0.219	0.414	0.167	0.373
25 to 34	0.256	0.437	0.308	0.462	0.203	0.403
35 to 44	0.220	0.414	0.237	0.425	0.202	0.401
45 to 54	0.139	0.346	0.126	0.332	0.153	0.360
55 to 64	0.081	0.273	0.064	0.244	0.100	0.300
65 and above	0.109	0.312	0.046	0.210	0.175	0.380
Gender						
Male	0.508	0.500				
Female	0.492	0.500				
Children						
No children	0.826	0.379	0.847	0.360	0.805	0.396
Parent, no change	0.104	0.306	0.085	0.279	0.124	0.330
Became parent	0.024	0.152	0.030	0.170	0.017	0.130
More children	0.006	0.080	0.008	0.089	0.005	0.071
Fewer children	0.014	0.116	0.010	0.101	0.017	0.130
No longer have children	0.026	0.159	0.020	0.141	0.032	0.176
*Interaction Gender*Children*						
No children	0.805	0.396				
Parent, no change	0.124	0.330				
Became parent	0.017	0.130				

More children	0.005	0.071				
Fewer children	0.017	0.130				
No longer have children	0.032	0.176				
Main source of income						
Wage	0.779	0.415	0.798	0.401	0.759	0.427
Agriculture and forestry	0.008	0.090	0.014	0.117	0.002	0.048
Business activity	0.081	0.272	0.104	0.305	0.057	0.232
Capital	0.040	0.196	0.028	0.166	0.052	0.221
Other	0.092	0.289	0.056	0.230	0.130	0.336
Denomination						
Protestant	0.476	0.499	0.459	0.498	0.495	0.500
Catholic	0.524	0.499	0.541	0.498	0.505	0.500
Land						
North Rhine-Westphalia	0.256	0.436	0.244	0.430	0.268	0.443
Baden-Württemberg	0.154	0.361	0.151	0.358	0.156	0.363
Bavaria	0.229	0.420	0.237	0.425	0.221	0.415
Bremen	0.006	0.078	0.005	0.070	0.007	0.086
Hamburg	0.010	0.099	0.008	0.089	0.012	0.109
Hesse	0.087	0.282	0.089	0.285	0.085	0.279
Lower Saxony	0.090	0.286	0.090	0.286	0.090	0.286
Rhineland-Palatinate	0.058	0.233	0.062	0.241	0.054	0.225
Saarland	0.015	0.123	0.015	0.123	0.015	0.122
Schleswig-Holstein	0.028	0.164	0.030	0.171	0.025	0.156
Berlin	0.021	0.144	0.018	0.131	0.025	0.156
Brandenburg	0.007	0.086	0.008	0.089	0.007	0.082
Mecklenburg-W. Pomerania	0.005	0.068	0.005	0.070	0.004	0.066
Saxony	0.017	0.128	0.018	0.133	0.015	0.123
Saxony-Anhalt	0.006	0.075	0.006	0.077	0.005	0.074
Thuringia	0.012	0.108	0.014	0.117	0.010	0.099

Mobility						
No mobility	0.957	0.203	0.954	0.210	0.961	0.195
West-West	0.032	0.175	0.034	0.181	0.029	0.168
West-East	0.008	0.092	0.010	0.097	0.007	0.085
East-East	0.001	0.026	0.001	0.027	0.001	0.025
East-West	0.002	0.048	0.002	0.048	0.002	0.047
Sample size	165,146		85,779		79,367	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Data is weighted with sample weights provided by Federal Statistical Office. Areas shaded in grey refer to variables that are not available for the particular subsample.

The results in Table 4.1 show that 9.5 % of the individuals in the sample leave the church between 2001 and 2005 – 10.5 % of the males and 8.3 % of the females. This number appears to be quite high at first sight. However, one has to keep in mind that this sample is not representative of the population as the whole. In fact, it is biased towards groups who are found to have a higher-than-average probability of leaving the church – young, unmarried people with their own income. There is not much data on disaffiliation rates by age or socio-economic characteristics available. However, in the light of the available research, the numbers in my sample seem reasonable. Birkelbach (1999: 143) calculates the average yearly disaffiliation rate of a cohort of students of higher secondary school *("Gymnasium")* in North Rhine-Westphalia who were born in 1955. Between the ages of 18 and 32 (between 1973 and 1987) their average yearly disaffiliation rates are above 1 % with significant variance. In some years, it even reaches values above 1.5 %. Eicken and Schmitz-Veltin (2012: 87-89) calculate the average yearly disaffiliation rates by age for Protestants and Catholics living in the city of Stuttgart for the period 1990 to 2009. They report that yearly disaffiliation rates are above 1 % for church members between the ages of 22 and 48 (Catholics) and 22 and 54 (Protestants), with maximum values of 2 % (Catholics) and 2.5 % (Protestants) occurring around the age of 30.

The average income in my sample is 21,000 euro with significant variance. The average church tax payment in 2001 amounts to 330 euro, which leads to a price of church membership of 183 euro. 50.8 % of the taxpayers in the sample are male, while 49.2 % are female. Around one quarter of individuals in the sample are in the age group 25 to 34 and roughly 20 % are younger. The age distribution differs significantly between males and females. Only 23.6 % of the male individuals are 45 or older, but 42.8 % of the female

taxpayers are. About 83 % of the individuals in the sample do not have children – 85 % of the men and 81 % of the women. Wage income is the main type of income of three quarters of the taxpayers in the sample. In line with the differences in the age distribution between men and women, a larger share of women is found to have "other" income (which includes pensions) as the main type of income. There are slightly more Catholics than Protestants in the sample. According to expectations, most taxpayers live in North Rhine-Westphalia and Bavaria, which are the largest Länder in Germany in terms of inhabitants. The share of individuals from all five East German Länder is low, which is mainly due to the the fact that church members are a minority in each of these Länder. Concerning mobility, I find that only 4 % of the individuals move to a different Land and there are very few moves of individuals originally living in East Germany.

4.6 Econometric approach

I employ binary logistic regression. The dependent variable is binary and has the value one if the individual disaffiliates from the church in any year between 2001 and 2005, zero otherwise. Independent variables are state variables in the year 2001 and changes in a variable between 2001 and 2005. Separate regressions for different subsamples as well as shorter time periods are estimated.

Discrete choice methods, such as binary logistic regression[87], are preferred to linear probability models when the variable of interest takes on a small number of discrete values (Greene, 2008: 773), in this case two: the individual either disaffiliates from the church or not. These values are coded as zero and one. However, in order to decide whether to disaffiliate or not, the individual needs to maximize his or her utility both as a church member and as a non-member and calculate the difference between these two utility levels (see equation (4.9) in the model in Section 4.4.1 above). If this difference is positive, the person remains a church member; if it is negative, the person disaffiliates. The difference in utility is a continuous variable, however, it cannot be observed. All that is observable is the discrete decision of the individual whether to disaffiliate or not.

I denote the utility difference between being a church member and not being a member by V_i^*. As I pointed out in the model section, this utility differential depends on a vector of independent variables $\boldsymbol{x_i}$, which include the price of church membership for the individual, his or her income and some individual characteristics of the church member:

$$V_i^* = \boldsymbol{x_i'\alpha} + \varepsilon_i \tag{4.1}$$

where ε_i is an error term. The continuous variable V_i^* is unobservable; instead I observe the decision whether to disaffiliate or not, V_i, which takes on values one ("yes") if V_i^* is negative, and zero ("no") otherwise,

$$V_i = \mathbf{1}[V_i^* < 0] \tag{4.2}$$

where $\mathbf{1}[.]$ is the indicator function.

I am interested in the effect of a change in the independent variable $\boldsymbol{x_i}$ on the probability that V_i is one. Using the relationships established above, I can write

$$\mathrm{P}(V_i = 1|\boldsymbol{x_i}) = \mathrm{P}(V_i^* < 0|\boldsymbol{x_i}) = \mathrm{P}(\varepsilon_i < -\boldsymbol{x_i'\alpha}|\boldsymbol{x_i}) = G(\boldsymbol{x_i'\alpha}) \tag{4.3}$$

[87] The discussion of binary logistic regression in this chapter is based on Wooldridge (2003: 530-533) and Greene (2008: 772-777).

where $G(.)$ is some continuous function which takes on values between zero and one. Usually the distribution function of the standard normal distribution or the logistic distribution are chosen. In accordance with previous literature (see, for example, Loveland, 2003; Brañas-Garza and Neuman, 2004) I have chosen the logistic function. Now the probability of individual i to disaffiliate can be calculated as

$$\mathrm{P}(V_i = 1|\boldsymbol{x_i}) = P_i = G(\boldsymbol{x_i'\alpha}) = \frac{\exp(\boldsymbol{x_i'\alpha})}{1 + \exp(\boldsymbol{x_i'\alpha})} \tag{4.4}$$

This expression is equivalent to

$$\ln\left[\frac{P_i}{1 - P_i}\right] = \boldsymbol{x_i'\alpha} \tag{4.5}$$

The left hand side of expression (4.5) is often called "logits" or "log-odds", whereas the fraction $P_i/(1 - P_i)$ is the odds ratio. The parameter α indicates how a change in some independent variable x_i affects the log-odds of the probability to disaffiliate. A change in the log-odds is hard to interpret, except for its sign. Exponentiating both sides of equation (4.5) to the base of *e* (Euler's number) allows the detection of the effect of a change in $\boldsymbol{x_i}$ on the odds ratio. Note that in such a model it is assumed that a change in $\boldsymbol{x_i}$ has a constant effect on the log odds of the probability P_i, whereas the effect on the probability itself is not constant. In fact, the effect of $\boldsymbol{x_i}$ on P_i depends on the value of the function $G(\boldsymbol{x_i'\alpha})$ and can only be calculated for specific values for each of the independent variables $\boldsymbol{x_i}$. It is common practice to report the average effects for the mean values of all independent variables.

When reporting partial effects, it is advisable to distinguish between continuous and discrete variables (Wooldridge, 2003: 532-533). The partial effect of a change in a continuous variable x_{ij} on the probability P_i can be calculated as

$$\frac{\partial P_i}{\partial x_{ij}} = \alpha_j * G'(\boldsymbol{x_i'\alpha}) \tag{4.6}$$

where $G'(.)$ is the probability density function of the logistic function:

$$G'(c) = \frac{\exp(c)}{[1 + \exp(c)]^2} \tag{4.7}$$

In contrast, for discrete variables and dummy variables one would simply insert each discrete value of the variable into $G(\boldsymbol{x_i'\alpha})$ together with the mean values for all remaining variables and calculate the resulting differences in probability.

In the results section, I present different versions of the estimates. The tables in the results section include the original $\boldsymbol{\alpha}$-coefficients of the logit estimation. In addition, I sometimes report changes in the odds ratio, which are simply the exponentiated values of the $\boldsymbol{\alpha}$-coefficients, but are easier to interpret. The advantage of the odds ratio is that it is constant and does not depend on the specific values of the independent variables $\boldsymbol{x_i}$. However, it has limited informative value when it comes to the economic interpretation of results. Therefore I also report the effects of a change in the $\boldsymbol{x_i}$ on the probability P_i at mean values of the independent variables. In addition, I create a model individual and discuss how changes in the independent variables affect this person's probability of disaffiliation. The model individual is mainly employed in the interpretation of results for the complete sample, while I draw on effects at average values when I compare different subsamples (e.g. males and females).

In order to test all hypotheses, I estimate different settings. First, I run a model for the complete sample described in Section 4.5.2. Then I provide results for different operationalizations of the variables capturing the price of church membership.

As a robustness test, I also run regressions for the subsamples of individuals who disaffiliated in 2002, 2003, 2004, and 2005. Furthermore, I run regressions where I replace the "price of church membership" with the amount of church tax, i.e. I use the amount of money the person gives to the church instead of how much that giving costs him or her in terms of the actual reduction in available income. I also present results for various subsamples, in particular for men and women, for East Germany and West Germany, and for Protestants and Catholics.

All estimations are carried out in SAS. The stratified sampling design is taken into account by using Survey-Procedures in SAS. In such procedures it is necessary to provide information as to which stratum the observation belongs to as well as the sampling weights. In addition, all information about the sampling is needed, therefore one cannot simply delete the observations that are not needed (in my case this would be, e.g., married taxpayers). If one is interested in results for subgroups of the sample, a domain analysis needs to be done. All the observations of interest would then be in the domain while the others are not. If information about the observations outside the domain of interest were missing, variances would not be estimated correctly.

As a goodness of fit measure I report the likelihood ratio test. The likelihood ratio test is based on the comparison of the values of the likelihood function under the null hypothesis (in my case the null model, i.e. a model only with a constant but without any independent

variables) and the alternative model (i.e. a model with independent variables). In particular, I report the values of -2 times the log-likelihood of the null and the alternative model, respectively. The difference of these two values is the likelihood ratio (LR) test statistic, which follows a χ^2-distribution with the number of degrees of freedom equal to the number of independent variables. The number of degrees of freedom of my models is larger than the number of independent variables which I report in my results because for discrete variables with more than two values each value takes up one degree of freedom, even if this value does not appear in the sample (domain) I look at.

4.7 Results

The entire table of estimation results for the complete sample as well as males and females separately can be found in Table A.3 in the appendix. In order to facilitate reading I present the results for each independent variable separately when the respective variable is discussed.

4.7.1 Price of church membership

Table 4.2 shows the results for price of church membership and income in the complete sample as well as the subsamples of males and females separately. The findings concerning income are discussed in the next section, but are nevertheless reported in Table 4.2 because they are closely connected to the results for the price of church membership. The label "Model 1a" refers to the standard operationalization of the price of church membership. The results for different operationalizations of this variable can be found in Table 4.3.

There is evidence that the price of church membership has a positive and significant influence on the probability to disaffiliate from the church. Looking at the results for the complete sample in Table 4.2, both the estimates for the price of church membership in 2001 and the change in the price of membership between 2001 and 2005 are highly significant. However, the effect is economically moderate. The estimate for a change in the price of church membership *("Δ Price")* between 2001 and 2005 is 0.055, which means that the odds of disaffiliation (see equation (4.5) in Section 4.6) increase by 5.6 % if church taxes increase by 100 euro.

A change in the odds of disaffiliation can also be expressed as a change in the probability of disaffiliation. However, in this case the original probability (i.e. without a change in church taxes) matters. I calculate the effect of a change in church taxes on the probability of disaffiliation for the sample average and for a model individual which I define below. At sample average values an individual has an estimated probability of leaving the church of 6.50 % if he or she does not experience an increase in church taxes. A 100 euro increase in the price of membership increases this probability by 0.33 %.

One can also look at the marginal effect of a price change on a model individual. My model individual is male, Catholic, in the age group 30 to 39, has no children, lives in the North Rhine-Westphalia and does not move to another Land during the observation period. His income in 2001 equals the average income and he does not experience income changes between 2001 and 2005. His main source of income is wages. The price of church membership in 2001 also corresponds to the sample average. Without a change in the price of

church membership his probability of disaffiliation is 9.50 %. The probability increases by 0.47 % when the price rises by 100 euro.

Table 4.2: Estimation results for price of church membership and income for the complete sample and for males and females separately

	Complete sample		**Subsample males**		**Subsample females**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Price						
Price 2001	**0.059**	125.619 (0.000)	**0.059**	69.621 (0.000)	**0.061**	55.615 (0.000)
Dummy Price 2001 positive	0.022	0.5388 (0.463)	-0.023	0.322 (0.571)	0.079	3.134 (0.077)
Δ Price	**0.055**	164.905 (0.000)	**0.053**	92.799 (0.000)	**0.060**	67.069 (0.000)
Income						
Income 2001	-0.000	0.0261 (0.872)	-0.001	0.253 (0.615)	0.001	0.126 (0.723)
Δ Income	**-0.002**	8.334 (0.004)	-0.003	6.500 (0.011)	-0.002	1.692 (0.193)
Sample size	165,146		85,779		79,367	
-2 Log L (constant only)	2,769,469		1,513,861		1,249,272	
-2 Log L (constant and covariates)	2,426,852		1,346,487		1,077,929	
Likelihood-Ratio χ^2	342,617 (53 df)		167,374 (41 df)		171,343 (41 df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, age dummy, dummy for children, main source of income, denomination, regional dummies and mobility. The estimation for the complete sample also includes a dummy for gender and the interaction of gender and children. Bold coefficients are significant at the 1 percent level.

The results also show that the price of church membership in 2001 *("Price 2001")* has a positive and significant effect on the probability to disaffiliate. This finding suggests that there is inertia in the church disaffiliation decision because increases in the price of membership before 2001 led to a reaction in the period under investigation. A perfectly rational individual should immediately react to changes in price and adjust his or her cost-benefit analysis of church membership. However, previous research suggests that many individuals are not aware of the amount of church taxes they have to pay and reconsider their

church membership only occasionally, e.g. when they fill out their tax returns. My finding can be interpreted as evidence for this observation. The estimated coefficient of 0.059 implies that a change of 100 euro in the price of membership in 2001 increases the odds of disaffiliation by 6.1 %. The probability of disaffiliation of the model individual (as described above) increases by 0.51 %.

In contrast to the price of membership in 2001, the dummy capturing whether someone paid church taxes at all *("Dummy Price 2001 positive")* is not significant and the estimate is close to zero, which suggests that it does not matter whether someone pays church tax at all, but rather how much.

With respect to income, I find no significant effect of the amount of income in 2001, but a small negative effect of a change in income between 2001 and 2005, indicating that an increase in income decreases the probability of disaffiliation. However, the estimated effect is economically small.

These first results lend support to hypothesis H 1 which states that after controlling for income an increase in church tax payments leads to an increase in the probability of leaving the church. Hyothesis H 2 receives moderate support: An increase in income appears to decrease the probability of disaffiliation, however, the effect is very small.

In order to investigate the influence of the price of church membership on the church membership decision more thoroughly, I include different variants of the price variable ("Model 1a" to "Model 1d") in the regressions. The results are shown in Table 4.3.

Table 4.3: Estimation results for the complete sample with different definitions of the variables measuring the price of church membership and income

	Complete sample		**Complete sample**		**Complete sample**		**Complete sample**	
	Model 1a		**Model 1b**		**Model 1c**		**Model 1d**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Price of church membership								
Price 2001	**0.059**	125.619 (0.000)	**0.059**	126.491 (0.000)	0.010	4.632 (0.031)	**0.056**	138.467 (0.000)
Dummy Price 2001 positive	0.022	0.539 (0.463)	0.021	0.508 (0.476)	0.012	0.160 (0.689)	**0.077**	6.949 (0.008)

Δ Price	**0.055**	164.905 (0.000)						
Δ Price – church (in 100)			**0.413**	17.001 (0.000)				
Δ Price – state (in 100)			**0.055**	167.054 (0.000)				
Dummy Price increase					**0.095**	14.356 (0.000)	**0.101**	14.788 (0.000)
Δ Price positive							**0.064**	203.766 (0.000)
Δ Price negative							-0.000	0.001 (0.975)
Income								
Income 2001	-0.000	0.0261 (0.872)	-0.000	0.013 (0.908)	**0.008**	54.138 (0.000)	**-0.004**	10.095 (0.002)
Δ Income	**-0.002**	8.334 (0.004)	**-0.002**	7.771 (0.005)	**0.005**	46.496 (0.000)	**-0.003**	11.819 (0.001)
Sample size	165,146		165,146		165,146		165,146	
-2 Log L (constant only)	2,769,469		2,769,469		2,769,469		2,769,469	
-2 Log L (constant and covariates)	2,426,852		2,426,583		2,429,263		2,423,400	
Likelihood-Ratio χ^2	342,617 (53 df)		342,886 (54 df)		340,206 (53 df)		346,067 (55df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, age dummy, gender dummy, dummy for children, interaction of gender and children, main source of income, denomination, regional dummies and mobility. Areas shaded in grey refer to variables that are not included in the estimation of the particular model. Bold coefficients are significant at the 1 percent level.

Model 1a in Table 4.3 corresponds to model 1a in Table 4.2 and is only reported in order to facilitate the comparison of results. Summary statistics for all variables are reported in Table 4.1. Only the results of the variables capturing the price of church membership and income are reported in Table 4.3. However, the original regressions include all variables reported in Table A.3. Since the results of the demographic, socio-economic and regional variables are virtually unchanged in comparison to model 1a, they are not reported again.

In model 1b the change in the price of church membership is captured by two variables: one measuring the change in the price caused by changes in the church tax regulations *("Δ Price – church")*, and another one that captures all other sources of changes in the church tax, in

particular income tax regulations and individual characteristics *("Δ Price – state")*. The idea here is to test whether individuals react differently to changes in their church tax payments that can directly be attributed to church tax regulations in comparison to changes that are due to the fact that the church tax uses the income tax as the tax basis. The coefficient of 0.413 for the variable *"Δ Price – church"* shows that changes in the price of membership caused by modifications of church tax laws have a sizeable and significant positive effect on the probability of disaffiliation. At the same time, the effect of changes in the price of membership caused by other reasons is comparable in its size and significance to the overall effect of a change in church tax found in model 1a (the estimated coefficients of the variable *"Δ Price – state"* in model 1b and of the variable *"Δ Price"* in model 1a are both 0.055). Applied to the reference individual, the estimations suggest that the marginal effect on the probability of disaffiliation of an increase in the price of church membership by 100 euro caused by changes in church tax regulations is 3.55 %, while an additional cost of 100 euro that cannot be attributed to the church has a marginal effect on the probability of 0.47 %. Both estimates must be compared to a probability of 9.5 % for those who do not experience an increase in the price of being a church member.

In model 1c in Table 4.3 I replace the change in price between 2001 and 2005 measured in euro with a dummy variable that signals whether the church tax has increased during that period of time *("Dummy Price increase")*, compared to the reference category of unchanged or decreased church tax. The idea behind this specification of the estimation is to test whether it is sufficient to use only a dummy variable that indicates an increase in church taxes and disregard the amount of this increase. Summary statistics reveal that in the sample the church tax increases for 52.4 % of the taxpayers. The positive and significant coefficient of the variable *"Dummy Price increase"* in model 1c shows that an increase in price significantly raises the probability of disaffiliation compared to those whose price of membership remains unchanged or decreases. The model individual is estimated to have a probability of disaffiliation of 9.4 %[88] if his church tax falls or does not change and 10.3 % if the church tax increases. What is more, the coefficient of the variable *"Price 2001"*, which measures the price of membership in 2001, is considerably smaller and loses significance in comparison to model 1a. Another interesting result in model 1c is that both income variables are now significant and positive. The reason might be that the income variable takes up some of the effects of the variable measuring the amount of change in the price of membership, since both

[88] This probability differs slightly from the probability of disaffiliation of the model individual of 9.5 % which was calculated on the basis of models 1a and 1b. The reason is that the probability depends on the coefficients of all variables in the estimation, which differ between the models.

are positively correlated. When comparing the Likelihood-Ratio χ^2-value of model 1c with model 1a, one can see that the value has decreased (while the degrees of freedom are the same). This indicates a decline in model fit in comparison to models 1a. The results of 1a and 1c taken together strongly suggest that individuals do not only react to the fact that they have to pay more for their church membership, but that the amount of this increase in price has explanatory power. Furthermore, the results underline that it is important to include both the price of church membership and the income in the estimations, otherwise one variable will pick up the effect of the other variable and results are biased.

Based on the conclusions from model 1c I include the amount of change in the price of membership again in model 1d, however, I measure the effect of an increase and a decrease in price separately. The plan is to test whether individuals react symmetrically to increases and decrases in the price of church membership. The estimation includes both a dummy variable indicating whether the individual experiences an increase in the price of church membership at all *("Dummy Price increase")* and the amount of the increase or decrease in the price (*"Δ Price positive"* or *"Δ Price negative"*, respectively). Results are reported in Table 4.3 in the two columns on the right. The results show that the dummy variable indicating an increase in price is still significant and the estimated coefficient of 0.101 is close to the estimate in model 1c. In addition, the variable measuring the amount of the increase in the price of church membership is also positive and significant, while a decrease in the price of membership appears to have no effect on the disaffiliation decision. The variable *"Dummy Price increase"* and *"Δ Price positive"* taken together imply that an increase in price increases the probability of disaffiliation per se, but the larger the increase, the higher the probability. The estimated size of the effect of a 100 euro increase in the price of church membership is even larger than before. The coefficient of 0.064 implies that the marginal effect of an increase in price by 100 euro is estimated at 0.52 % for the model individual. At the same time, a decrease in price does not noticeably lower the probability of disaffiliation which can be seen from the estimated coefficient of -0.000 for the variable *"Δ Price negative"*. Comparing the Likelihood-Ratio statistic for model 1d with model 1a, there is a considerable difference in the χ^2-value, which hints at the fact that a separate inclusion of increases and decreases in the price of membership improves the model fit. The asymmetric reaction to increases and decreases in price is in line with my theoretical considerations. I assume that an individual is a church member because his or her benefits of church membership exceed the costs. When the individual experiences an increase in the costs, these can eventually be larger than the benefits and the individual then decides against church membership. However, when the individual

experiences a decrease in costs, the cost-benefit-ratio improves, but *ceteris paribus* the binary membership decision is not affected, since being a church member is beneficial for the individual before and after the decrease in the costs of membership.

Table A.4 in Appendix D.2 shows the estimation results when the amount of church tax is used instead of the price of church membership. The findings based on the variables measuring the church tax and resp. the price of church membership are substantially the same. Both the amount of church tax paid in 2001 *("Church tax 2001")* and the change in church tax between 2001 and 2005 *("Δ Church tax")* significantly increase the probability of disaffiliation. I also find that an increase in church tax has a larger effect on the probability of leaving the church than a decrease in church tax. A detailed discussion of the results can be found in Appendix D.2.

In order to make better use of the panel structure of the data and to see if results are constant over time, I present separate estimations for church disaffiliations that happen in each year between 2002 and 2005. The results can be found in Table A.5 in Appendix D.2. The findings confirm the overall conclusion from the estimations for the period between 2001 and 2005: both the price of church membership in the original year and the change in price have a positive and significant effect on the probability to disaffiliate. For a more in-depth discussion consult Appendix D.2.

Looking at the separate results for males and females in Table 4.2 also reinforces the results for the complete sample: for males as well as females, both the price of church membership in 2001 and the change in price between 2001 and 2005 significantly affect the probability of leaving the church and the estimates are in line with the numbers presented for the combined sample. The estimated coefficients are marginally larger for women; however, these differences are small. When model 1d includes separate variables for positive and negative changes in the price of membership and is estimated for males and females separately (results not reported), the results for both genders are virtually identical with the results for the complete sample in Table 4.2, both with respect to the size and the significance of the effects. The only difference exists with respect to the dummy variable indicating whether someone pays a positive price for church membership in 2001 *("Dummy Price 2001 positive")*. This variable is insignificant for males, but significant and positive for females. A possible explanation for this difference could be structural differences between genders in the set of individuals whose price of membership is zero. In the sample of females, there are more individuals above the age of 65 and more individuals with children, both of which are less

likely to pay church taxes, as well as being groups with a comparatively low propensity to disaffiliate (as will be discussed below).

To summarize, all the results produced with different definitions of the price variable (models 1a to 1d) as well as with the amount of church tax (models 2a and 2d) support hypothesis H 1 which states that an increase in the price of church membership increases the probability of disaffiliation.

4.7.2 Income

From the results in Table 4.3 above and Table A.4 in the appendix it is difficult to arrive at a consistent interpretation of the income effect, since the estimates both for the level of income in 2001 *("Income 2001")* and the change between 2001 and 2005 *("Δ Income")* show different signs and also vary in their level of significance. However, the income variables are only positive in model 1c when the amount of change in the price of church membership is not included in the estimation. Since income and price of church membership are positively correlated, it is highly likely that the income variables pick up the effect of the price of membership. As I pointed out before, this result underlines the necessity to include both income and the price of church membership in the regression. In estimation 1d, when the price of membership is adequately controlled for, the income variables lose some of their significance and the sign changes, i.e. they become negative. This is in line with hypothesis H 2, which states that an increase in income leads to a reduction in the probability of disaffiliation. The results show that the same applies to a higher initial income. Nevertheless, the economic effect is small. For the model individual (who has an income that corresponds to the sample average), the estimated probability of disaffiliation is 8.8 % in model 1d. If his income in 2001 is twice the sample average, the estimated probability decreases to 8.1 %.

4.7.3 Demographic variables

4.7.3.1 Age

Table 4.4 shows the estimation results for the dummy variable age. In accordance with hypothesis H 3 I expect to find a hump-shaped age profile of church disaffiliation which peaks around age 30.

The results in Table 4.4 suggest that individuals' age has a large effect on the probability of church disaffiliation. The probability is highest in the two youngest age cohorts and increases slightly from the cohort below 25 years of age to the cohort aged 25 to 34. Consequently, there seems to be some support that there is a peak close to age 30. However, the difference in

the estimated coefficients for the age groups 25 and 34 and below 25 is small and insignificant. What is more, the estimations for various two-year periods in Table A.5 in the appendix suggest that the probability of leaving the church is highest in the youngest age group and drops afterwards. The difference between the estimates for the two youngest age groups is small and insignificant for disaffiliations in 2002 and 2003 and somewhat larger and significant for disaffiliations in 2004 and 2005. All estimations consistently show that in older age groups the probability to disaffiliate decreases rapidly. In fact, the odds of disaffiliating are roughly 13 times higher in the age group 25 to 34 compared to the oldest age group above 65.

Table 4.4: Estimation results for age for the complete sample and for males and females separately

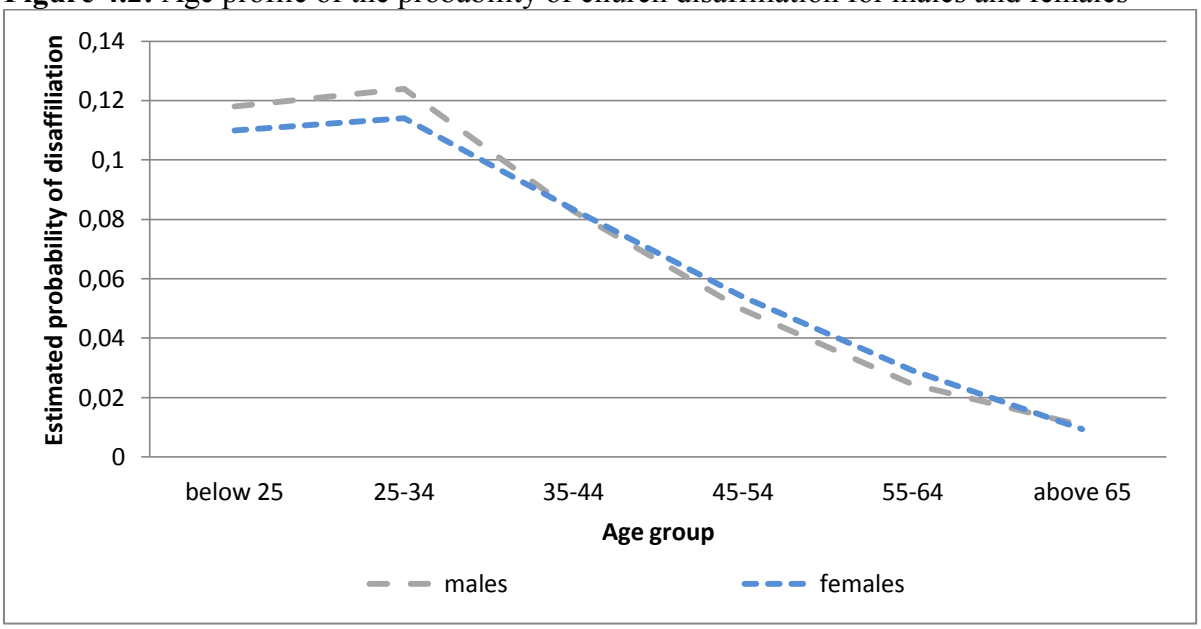
	Complete sample		**Subsample males**		**Subsample females**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Age						
Below 25	*ref.*	---	*ref.*	---	*ref.*	---
25 to 34	0.049	2.459 (0.117)	0.056	1.910 (0.167)	0.042	0.721 (0.396)
35 to 44	**-0.361**	99.527 (0.000)	**-0.395**	70.363 (0.000)	**-0.307**	29.363 (0.000)
45 to 54	**-0.857**	368.981 (0.000)	**-0.941**	231.648 (0.000)	**-0.772**	140.876 (0.000)
55 to 64	**-1.527**	572.462 (0.000)	**-1.674**	303.089 (0.000)	**-1.415**	262.806 (0.000)
65 and above	**-2.588**	991.511 (0.000)	**-2.531**	248.244 (0.000)	**-2.573**	653.652 (0.000)
Sample size	165,146		85,779		79,367	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, price of church membership, income, dummy for children, main source of income, denomination, regional dummies and mobility. The estimation for the complete sample also includes a dummy for gender and the interaction of gender and children. Bold coefficients are significant at the 1 percent level.

The results with respect to age are very similar for males and females. The age profile of the probability to leave the church for both genders can be seen in Figure 4.2. The graph is developed from the results of the separate estimation for males and females with model 1a

reported in Table 4.4. Age dummies are set at each discrete value while keeping all other variables at their sample averages, taking into account that sample averages differ between males and females. The estimated probability of disaffiliation starts off at 11.0 % for females and 11.8 % for males, then increases slightly from the youngest age group to the second youngest group and declines steadily and rapidly afterwards until it reaches a probability of only around 1 % in the oldest age group.[89]

Figure 4.2: Age profile of the probability of church disaffiliation for males and females



Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.

The results confirm earlier studies showing that church disaffiliation usually happens at a young age. There is mixed evidence concerning hypothesis H 3, which states that there is a peak in the probability of disaffiliation around age 30. While the estimates in Table 4.4 seem to support the hypothesis, the results for individual years in Table A.5 suggest that the peak may occur even earlier. However, one has to keep in mind that my data set includes only those individuals who file a tax return. These are usually the ones who have some kind of income (and potentially pay church taxes), while most young people who are still in the

[89] The similarity of the graphs for males and females might at first sight be inconsistent with the fact that in my sample 10.5 % of males leave the church between 2001 and 2005, but only 8.3 % of females. However, the difference can be explained by the different age compositions of the two samples. While only 4.6 % of males are in the age group above 65 years – which has by far the lowest probability of disaffiliation – the same is true for 17.5 % of females. However, when comparing men and women in the same age group gender differences are smaller.

educational system are not included. Consequently, I might overestimate the propensity to drop out of church for the youngest age group.

Whether the age profile of disaffiliation is due to age or cohort effects cannot be answered with the available data. Data covering a longer time period would be necessary for such research. However, previous research with survey data suggests that in Germany both age and cohort effects exist (Lois, 2011a).

4.7.3.2 Gender and children

The results for the two variables *"Gender"* and *"Children"* and their interaction can be found in Table 4.5. The hypotheses to be tested are H 4 to H 6. I expect that being or becoming a parent decreases the probability of disaffiliation, whereby the effect is expected to be stronger among women than men. In contrast, there should be no difference in the probability of leaving the church between males and females without children.

Table 4.5: Estimation results for gender, children and the interaction of gender and children for the complete sample and for males and females separately

	Complete sample		**Subsample males**		**Subsample females**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Gender						
Male	*ref.*	---				
Female	0.020	0.646 (0.422)				
Children						
No children	*ref.*	---	*ref.*	---	*ref.*	---
Parent, no change	**0.1881**	12.606 (0.000)	**0.219**	16.314 (0.000)	**-0.291**	23.987 (0.000)
Became parent	-0.072	0.850 (0.357)	-0.068	0.749 (0.387)	-0.217	4.180 (0.041)
More children	-0.382	4.408 (0.036)	-0.370	4.075 (0.044)	**-0.991**	10.693 (0.001)
Fewer children	0.083	0.251 (0.616)	0.141	0.711 (0.399)	-0.100	0.465 (0.495)
No longer have children	**0.299**	8.244 (0.004)	**0.348**	10.855 (0.001)	**0.321**	11.466 (0.001)

*Interaction Gender*Children*						
No children	*ref.*	---				
Parent, no change	**-0.460**	36.799 (0.000)				
Became parent	-0.161	1.510 (0.219)				
More children	-0.605	2.938 (0.087)				
Fewer children	-0.143	0.429 (0.512)				
No longer have children	0.073	0.279 (0.597)				
Sample size	165,146		85,779		79,367	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, price of church membership, income, age dummy, main source of income, denomination, regional dummies and mobility. Areas shaded in grey refer to variables that are not included in the estimation for the particular subsample. Bold coefficients are significant at the 1 percent level.

Estimates must be interpreted in the following way: The variable *"Gender"* indicates differences in the propensity to disaffiliate between men and women for childless individuals, i.e. in the reference category of the variable *"Children"*. The variable *"Children"* indicates the effects of having children in the reference category for gender, which is "Male". In other words, this variable shows how having children affects a man's probability to disaffiliate in comparison to a childless male person. The interaction term *"Interaction Gender*Children"* shows whether the coefficients of the children variable differ for males and females. In order to compare the effect of being a mother with the reference category of a childless women, the values for *"Children"* and *"Interaction Gender*Children"* need to be added together. If a woman with children is to be compared with a childless man, the coefficients for *"Gender"*, *"Children"* and *"Interaction Gender*Children"* need to be added.

If one looks at the separate estimation results for males and females in Table 4.5, it is only possible to compare individuals of the same gender with different values of the *"Children"* variable, but it is not possible to compare males and females. However, one would expect that the estimates of the *"Children"* variable in the estimation for the complete sample correspond to the estimates of the *"Children"* variable in the estimation for males only and that the sum of the estimates of the *"Children"* variable and the interaction term *"Interaction*

*Gender*Children"* in the combined estimation is similar to the estimates of the *"Children"* variable in the equation for females only. It can easily be seen in Table 4.5 that the estimation results for the complete sample and the two sub-samples are indeed very similar.

I find that children have a stronger influence on the church membership decisions of women than that of men. This can be seen from the Wald-χ^2 test statistic of the *"Children"* variable. The χ^2-values of the first three values of the *"Children"* variable are larger for women than for men.

The dummy variable *"Gender"* is not significant, which suggests that there is no significant difference in the odds of disaffiliating from the church between childless men and women, thereby lending support to hypothesis H 5. This finding can be repeated when one uses the variables measuring the church tax instead of the price of church membership (results are not reported) and in the estimation results for each single year of church disaffiliations (see Table A.5 in the appendix).

However, the estimation results suggest that there are differences between men and women when children are present. For men I find that those who are fathers have higher odds of disaffiliation than men without children, but becoming a parent, in particular if children are already present, reduces the odds. While the effect for being a parent is significant, the effect of having (another) child is not.

For women, the situation is different. Being a mother significantly reduces the odds of disaffiliation in comparison to both fathers and childless women. The effect of having the first child is also negative compared to not having children, but only marginally significant. In contrast, having an additional child decreases the odds of disaffiliation significantly, even stronger than for men.

These findings suggest that it is enlightening not only to look at differences between men and women, but to interact gender with the family situation. By doing so, hypothesis H 4 is partly supported: the effect of having an (additional) child seems to be negative for both genders, while being a parent reduces the odds of disaffiliating only for women but increases them for men. Hypothesis H 6 is backed empirically: The size of the effect of children on church disaffiliation is greater for women than for men.[90]

[90] When looking at the results for disaffiliation in a single year in Table A.5 in the appendix, the estimates are more heterogeneous. There is some support that being a parent decreases the odds of disaffiliation for mothers, while the estimates for fathers change sign. For the other cases (have more or fewer children in the household)

4.7.4 Socio-economic variables

Table 4.6 shows the estimation results for the two socio-economic variables *"Main source of income"* and *"Denomination"*. Concerning the main source of income, I expect that individuals working in agriculture are the least likely to leave the church, while taxpayers who receive income from business activity profess a comparably high probability to leave the church. With respect to denomination the hypothesis is that Catholics are less likely to disaffiliate than Protestants.

Table 4.6: Estimation results for main source of income and denomination for the complete sample and for males and females separately

	Complete sample		**Subsample males**		**Subsample females**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Main source of income						
Wage	*ref.*	---	*ref.*	---	*ref.*	---
Agriculture and forestry	**-1.866**	87.249 (0.000)	**-2.050**	112.402 (0.000)	-0.771	1.868 (0.172)
Business activity	**0.220**	57.466 (0.000)	**0.196**	29.669 (0.000)	**0.262**	27.211 (0.000)
Capital	**-0.214**	11.754 (0.001)	**-0.241**	7.670 (0.006)	-0.197	4.822 (0.028)
Other	-0.074	1.982 (0.159)	-0.060	0.651 (0.420)	-0.093	1.543 (0.214)
Denomination						
Protestant	*ref.*	---	*ref.*	---	*ref.*	---
Catholic	**-0.357**	220.105 (0.000)	**-0.401**	160.926 (0.000)	**-0.297**	64.017 (0.000)
Sample size	165,146		85,779		79,367	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, price of church membership, income, age dummy, dummy for children, regional dummies and mobility. The estimation for the complete sample also includes a dummy for gender and the interaction of gender and children. Bold coefficients are significant at the 1 percent level.

there is also a diverse picture, which might be due to the fact that the estimations for one year only take into account changes in the number of children in the household that happen in the year of disaffiliation, while the estimations in Table 4.5 cover changes over the whole period from 2001 to 2005. This suggests that having more or less children in the household does not necessarily have an immediate effect on church membership.

4.7.4.1 Main source of income

I find that I can fully support hypothesis H 9 concerning the effect of different sources of income. There are sizable differences in the probability to disaffiliate between individuals generating income from agriculture and forestry and those whose main source of income is business activity. The estimated coefficient of -1.866 for *"Agriculture and forestry"* means that the odds of disaffiliation of persons whose main source of income is from agriculture and forestry are reduced by a factor of 6.5 (or 84.5 %) compared to wage earners, while the estimate of 0.220 for *"Business activity"* implies that the odds are 24.7 % higher compared to wage earners if the main income source is business activity. Translated to the model individual, the probability of disaffiliation is around 1.6 % if he works in agriculture and forestry and 11.6 % if he mainly has income from business activity. In addition, I find a significantly reduced probability of disaffiliation for individuals whose main source of income is capital or rent and leasing. Their odds of disaffiliation are reduced by 19.2 % in comparison to wage earners.

Direction and size of the effect of capital income and income from business activity as the main income sources are the substantially the same for males and females. However, the effect of income from agriculture and forestry as the main income source is smaller for women – although still negative compared to wage earners – and insignificant, while it is highly significant for males.

The results appear to be very robust both when estimations are performed with the church tax variables instead of the price of church membership (results not shown) and in the estimations for each single year of church disaffiliations (see Table A.5 in Appendix D.2).

4.7.4.2 Denomination

Catholics are found to be significantly less likely to leave the church than Protestants, thereby supporting hypothesis H 7. The effect of the dummy variable for *"Denomination"* is very stable over different variants of the estimation and is of considerable size. The coefficient of -0.357 implies that being Catholic decreases the odds of disaffiliation by around 30.0 %. For the example of the model individual this means that his probability of disaffiliation is on average 9.5 % as a Catholic but 13.0 % as a Protestant.

The difference between denominations seems to be a bit larger for men than for women. While for men being Catholic reduces the odds of disaffiliation by 33.1 %, it reduces them by only 25.7 % for women. This finding is contrary to expectations. However, it might be due to

the choice of the sample: probably unmarried women with their own income find themselves in some conflict with traditional church teachings, even more so when they are Catholic as compared to Protestant.

4.7.5 Regional variables

The results concerning the federal state of residence and mobility can be found in Table 4.7. Concerning the *"Land"* I expect that individuals living in more urban areas, especially in large cities, are more likely to leave the church than people in rural areas (hypothesis H 12). With respect to *"Mobility"*, I have formulated hypothesis H 13 that individuals who are mobile are more likely to disaffiliate than those who do not change the federal state of residence.

Table 4.7: Estimation results for federal state of residence and mobility for the complete sample and for males and females separately

	Complete sample		**Subsample males**		**Subsample females**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Land						
North Rhine-Westphalia	*ref.*	---	*ref.*	---	*ref.*	---
Baden-Württemberg	**-0.160**	17.257 (0.000)	-0.079	2.456 (0.117)	**-0.277**	20.849 (0.000)
Bavaria	-0.082	5.715 (0.017)	**-0.138**	8.970 (0.003)	-0.006	0.015 (0.902)
Bremen	**0.725**	125.448 (0.000)	**0.736**	67.026 (0.000)	**0.717**	58.689 (0.000)
Hamburg	**1.013**	289.150 (0.000)	**1.068**	166.642 (0.000)	**0.965**	125.965 (0.000)
Hesse	0.102	5.609 (0.018)	0.062	1.177 (0.278)	0.156	5.640 (0.018)
Lower Saxony	0.068	2.410 (0.121)	0.037	0.396 (0.529)	0.114	2.885 (0.089)
Rhineland-Palatinate	**-0.203**	14.958 (0.000)	-0.134	4.057 (0.044)	**-0.312**	13.111 (0.000)
Saarland	**-0.323**	19.538 (0.000)	**-0.301**	10.329 (0.001)	**-0.345**	8.803 (0.003)
Schleswig-Holstein	**0.305**	27.928 (0.000)	**0.389**	28.353 (0.000)	0.198	4.385 (0.036)

Berlin	**1.256**	651.065 (0.000)	**1.344**	384.555 (0.000)	**1.175**	268.604 (0.000)
Brandenburg	0.099	1.020 (0.313)	0.017	0.017 (0.895)	0.207	1.803 (0.179)
Mecklenburg-W. Pomerania	0.141	1.706 (0.192)	0.050	0.149 (0.700)	0.236	2.204 (0.138)
Saxony	0.147	4.270 (0.039)	0.074	0.610 (0.435)	0.252	5.460 (0.020)
Saxony-Anhalt	**0.285**	8.471 (0.004)	0.245	3.580 (0.059)	0.342	5.189 (0.023)
Thuringia	**-0.399**	21.583 (0.000)	**-0.476**	18.206 (0.000)	-0.283	4.342 (0.037)
Mobility						
No mobility	*ref.*	---	*ref.*	---	*ref.*	---
West-West	**1.461**	1208.793 (0.000)	**1.447**	677.611 (0.000)	**1.484**	528.827 (0.000)
West-East	**3.505**	1676.500 (0.000)	**3.487**	983.255 (0.000)	**3.533**	689.637 (0.000)
East-East	**2.454**	115.804 (0.000)	**2.542**	71.311 (0.000)	**2.356**	45.726 (0.000)
East-West	**0.919**	55.246 (0.000)	**1.036**	38.019 (0.000)	**0.814**	20.139 (0.000)
Sample size	165,146		85,779		79,367	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, price of church membership, income, age dummy, dummy for children, main source of income and denomination. The estimation for the complete sample also includes a dummy for gender and the interaction of gender and children. Bold coefficients are significant at the 1 percent level.

4.7.5.1 Federal state of residence

There are strong and highly significant differences in the propensity to leave the church between the German Länder, even after controlling for a battery of individual-level variables, most notably denomination. Results for each Land in Table 4.7 need to be interpreted as differences in the propensity to renounce church membership in comparison to the reference Land North Rhine-Westphalia. North Rhine-Westphalia was chosen as a reference because it is the largest Land in terms of inhabitants. The highest propensity to disaffiliate is found for people living in Berlin, followed by the two city states Hamburg and Bremen. The results also show that in West Germany the odds of disaffiliating are particularly high in the Northern German Land Schleswig-Holstein and take on medium values in the Northern German Land

Lower Saxony as well as the central German Länder Hesse and North Rhine-Westphalia. In contrast, disaffiliation rates are comparably low in the South-West of Germany (Saarland and Rhineland-Palatinate) as well as in the South (Baden-Württemberg and Bavaria).

Turning now to the East German Länder, I find that all of them but one show higher odds of disaffiliation than North Rhine-Westphalia, although the differences are only significant for Saxony-Anhalt. The estimated coefficients of the dummy variables for the East German Länder lie between those for Hesse and Schleswig-Holstein. An exception within East Germany is the Land Thuringia, where the odds of opting out of church are low, comparable to those of the Länder in the South-West of Germany.[91]

The general pattern of results also appears in the estimations for males and females separately (see Table 4.7) and in all estimations for individual years (see Table A.5 in the appendix), with only few divergent results. The results by gender in Table 4.7 suggest that East German women are somewhat more likely to leave the church than West German women (while controlling for all other variables) while East German men have a probability of disaffiliation which is comparable to that of men from the Länder in the northern and central parts of West Germany.

The finding from Table 4.7, in particular the highly significant and sizable effects for the city states, lend some support to hypothesis H 12 that people living in large cities have a higher propensity to disaffiliate than people living in more rural areas. Looking at the model individual, I pointed out already that his probability of church disaffiliation is 9.5 % when the dummy for the Land is in the reference category North Rhine-Westphalia. This probability increases to 26.9 % if he instead lives in Berlin. In other words, the odds of disaffiliation increase by 251 %. Since the same pattern is also found in the sub-samples of males and females and for individual years, the support for high disaffiliation rates in city states is strong.

However, if only the non-city states are considered, the influence of urbanization is hard to detect. It is not possible to include urbanization directly in the estimation. In order to check if there is a correlation between urbanization and the propensity to leave the church, I compare

[91] When interpreting the Länder dummy variables one should keep in mind that the effect of being Catholic is already measured separately. As I discussed earlier, being Catholic significantly decreases the odds of disaffiliation. The regional differences in disaffiliation cannot simply be attributed to the higher share of Catholics in regions where disaffiliation rates are low. Since in the Länder in the South and South-West of Germany the majority of church members are Catholic, while in the North and East of Germany the majority are Protestant, the actual differences in average disaffiliation rates will be even larger than what the results for the single Länder suggest.

the estimation results for the different Länder with data on the urbanization of each Land. I take into consideration the percentage of the population in each Land that lives in cities with more than 50,000 inhabitants as well as the percentage of the population living in municipalities with less than 3,000 inhabitants. Data are reported in Table 4.8.[92] In order to ease the comparison with the regression results, I repeat the estimation coefficients of the Länder dummies for the complete sample in the second column of Table 4.8.

On the one hand, some Länder with low urbanization rates such as Saarland and Rhineland-Palatinate do indeed show the lowest disaffiliation rates. On the other hand, the odds of disaffiliation are high for people living in Schleswig-Holstein, although this Land is also rather rural; and in North Rhine-Westphalia the estimated probability of disaffiliation is smaller than one would expect given the high density of agglomerations. For East Germany, urbanization does not help to explain the exceptionality of Thuringia, which has an average level of rurality among East German Länder. In sum, there is at best mixed evidence that people living in rural regions have a lower probability of church disaffiliation.

However, it might also be the case that the social pressure does not depend primarily on the rurality of the region of residence, but on the average church membership rates in the area. Therefore I compare the estimation results with the share of Catholics, Protestants and both denominations together in each Land.[93] Data for this model are reported in Table 4.8.

The results unambiguously show that there is a strong relationship between the share of church members in 2001 (Catholic and Protestant taken together) and the estimated effect of the Länder on the propensity to disaffiliate. For West Germany, the correlation between the share of church members and the regression coefficients for the Länder dummy variables is -.98 – in other words, there is almost perfect negative correlation between the share of church members and the propensity to leave the church. The result is also stable with respect to the inclusion and exclusion of Berlin. Furthermore, the result is strongly driven by the share of Catholics, while it is substantially unrelated to the share of Protestants. This is because the total percentage of church members is highly correlated with the share of Catholics (r=.82 in West Germany when Berlin is included), but unrelated to the share of Protestants (r=-.07 in West Germany when Berlin is included). In sum, it appears that a high share of Catholics in the region prevents individuals from disaffiliating.

[92] Data are taken from the Federal Statistical Office and refer to December 31st, 2004 (Statistisches Bundesamt, 2006: 40-41).
[93] Data are taken from the statistical department of the Evangelical Church in Germany (EKD, 2003a: 8) and refer to December 31st, 2001.

Table 4.8: Regression coefficients (taken from model 1a for the complete sample), share of urban and rural population, religious composition, and regulations for church disaffiliation by Land

Land	regression coefficient	inhabitants city (> 50,000)	inhabitants rural (< 3,000)	% Protestant	% Catholic	% church members	authority for disaffiliation	fee for disaffiliation in 2002 (euro)
Thuringia	-0.399	20.1	27.6	26.1	8.1	34.3	DC	0
Saarland	-0.323	17.1	0	20.0	65.3	85.3	DC /CRO	30.70
Rhineland-Palatinate	-0.203	22.4	37.1	31.9	46.9	78.8	CRO	20.45
Baden-Württemberg	-0.160	27.1	5.8	34.0	38.0	72.1	CRO	differs by city
Bavaria	-0.082	25.3	15.2	21.7	58.0	79.7	CRO	31
North Rhine-Westphalia	0	63.4	0.0	28.6	43.0	71.6	DC	0
Lower Saxony	0.068	28.5	10.1	52.0	17.9	69.8	CRO	24
Brandenburg	0.099	15.3	11.4	19.2	3.1	22.3	DC	0
Hesse	0.102	30.3	1.3	41.3	25.6	67.0	DC	20
Mecklenburg-W. Pomerania	0.131	27.7	34.1	18.4	3.4	21.8	CRO	10
Saxony	0.147	34.0	9.6	21.6	3.7	25.2	CRO	20.45
Saxony-Anhalt	0.285	21.8	30.5	15.7	4.1	19.7	CRO	20.45
Schleswig-Holstein	0.305	24.0	26.7	56.3	6.1	62.3	CRO	10
Bremen	0.725	100.0	0.0	44.1	12.2	56.4	CRO	0
Hamburg	1.013	100.0	0.0	32.2	10.1	42.3	CRO	20
Berlin	1.256	100.0	0.0	22.0	9.2	31.2	DC	0

Data sources: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006; EKD (2003a); Statistisches Bundesamt (2006); own calculations.
Note: DC=district court, CRO=civil registry office.

The low average share of church adherents and the very low share of Catholics might also be reasons for the above-average church disaffiliation rates in East Germany. Church disaffiliations are usually not rejected by society and do not entail significant social disadvantages in East Germany. However, this pattern of explanation reaches its limits when

it comes to the exceptionality of Thuringia. In fact, Thuringia has the highest share of church members and the highest share of Catholics of all East German Länder, which might serve as an explanation why the propensity to renounce church membership is below the East German average; however, it does not explain why Thuringians have the lowest estimated probability of disaffiliation of all Länder in Germany, because in comparison to Länder in the South and South-West of Germany church membership in Thuringia is exceptionally low – church members are a minority here.

I discussed earlier that the dummy variables for the Länder are also intended to capture the transaction costs for church disaffiliation, which consist of the time necessary to go to the state authority that accepts declarations of church disaffiliation (district courts or civil registry offices) and the fees for disaffiliation. Information on the responsible state authorities as well as fees in the year 2002 can be found in the last two columns of Table 4.8. Information on changes over time between 2001 and 2006 can be found in Appendix B.

The reason why the authority that accepts declarations of church disaffiliation matters is that usually there are more civil registry offices than district courts in a certain area, i.e. the distance to the civil registry office is often shorter than to the district court. In addition, civil registry offices are usually on the same premises as other offices run by the municipality, such as the registration office *("Einwohnermeldeamt")* or the administration of (small) municipalities. Therefore it seems likely that individuals have more opportunities to go to the civil registry office than to the district court. However, when looking at the connection between the estimated coefficients of the Länder dummies and the authorities responsible for declarations of church disaffiliations, there appears to be very little correlation. District courts are responsible in Saarland, which has very low disaffiliation rates, but also in North Rhine-Westphalia and Hesse, which have rather high disaffiliation rates compared to other West German Länder and even in Berlin, where disaffiliation rates are very high. For East Germany, the estimated coefficients of Brandenburg and Mecklenburg-Western Pomerania differ only minimally, although in the former the district court and in the latter the civil registry office is responsible. In sum, there is hardly any evidence that going to the district court entails higher transaction costs than going to the civil registry office.

There appears to be a moderate negative correlation between the estimation coefficients and the fees in the West German Länder, indicating that the propensity to disaffiliate is low where

fees are high. The costs are comparably high in Saarland, Bavaria and Baden-Württemberg[94], while they are lower in Schleswig-Holstein, Bremen and Berlin. In contrast to that, there is – if anything – a positive correlation in East Germany and some Länder stand out as exceptions: Hamburg, which has a high disaffiliation rate despite the comparably high costs and Thuringia, which has the lowest rate although there are no fees. As a result, I cannot find enough evidence to show that the costs of disaffiliation are prohibitively high in some Länder. However, the results do not contradict this hypothesis either.

4.7.5.2 Mobility

The effects of mobility between German Länder are all found to be positive, very sizable and highly significant. Thereby the results lend support to hypothesis H 13, which states that mobility increases the probability of disaffiliation.

The highest odds of disaffiliation are found for individuals moving from West Germany to East Germany. The size of the effect is exceptional; in fact, the coefficient of 3.505 for the dummy variable *"West-East"* in Table 4.7 suggests that the odds of disaffiliation are 32 times higher for someone who moves than for someone who stays. The probability to disaffiliate of the model individual is estimated at almost 78 % if he moves from West Germany to East Germany, in contrast to 9.5 % if he does not move. Moving within East Germany also significantly increases the probability of disaffiliation; the odds ratio is over 10 times higher than for someone who stays.

The effect of interregional mobility within West Germany is smaller, but still sizable. The odds increase by a factor of 3.3. For the model individual this implies an increase in the probability of disaffiliation from 9.5 % to 31 %. The smallest effect of mobility is found for those individuals who move from East Germany to West Germany. Here the odds of opting out of church increase by the factor 1.5.

Looking at the results for males and females separately, the results for the mobility dummies are very similar to the results for the complete sample.

In general, the findings imply that mobility is a decisive factor in church membership decisions. The high relevance is not only due to the exceptional size of the effects, but also the fact that in modern society mobility is steadily increasing. As far as I am aware, mobility is up to now largely neglected in research on church disaffiliations in Germany or the effects are

[94] Baden-Württemberg is the only Land where fees vary between cities. They are also comparably high. Petersen (2010: 137) reports that they are in the range of 15 to 60 euro.

negated as in Feige (1976). Although I agree with Feige (1976) that mobility itself is not the reason for leaving the church, it seems to be an important trigger.

A possible reason why mobility and church disaffiliation often coincide is that church disaffiliation requires some paperwork, such as going to the civil registry office or the district court. When individuals move, they have to register their new residence at the registration office *("Einwohnermeldeamt")*. The registration office is run by the city, as is the civil registry office *("Standesamt")*. In some cities, the two authorities are in the same building, so it might be easy to go to the civil registry office if one has to go to the registration office anyway. This might be a good opportunity to disaffiliate from the church if this has been on the individual's mind already. However, it needs to be mentioned that the two state authorities are not the same, i.e. one cannot register the new residence and disaffiliate from the church during the same appointment. In some cities, the two authorities are also located in different places.

Since the regulations concerning where to carry out the church disaffiliation differ between the Länder, I use this difference and test whether more people disaffiliate when they move to a Land where church disaffiliation can be carried out in the civil registry office (as compared to the district court). Which regulation applies in which Land can be found in Appendix B. I create a dummy variable capturing whether an individual who moves needs to disaffiliate at the civil registry office or the district court, which is intended to capture how easy it is to disaffiliate while moving.[95] The results can be found in Table 4.9.

The dummy variable for the authority responsible for disaffiliation is significant and shows the expected sign, i.e. individuals are more likely to disaffiliate if they move to a place where they can disaffiliate at the civil registry office instead of going to the district court. However, the size of the effect is moderate, increasing the odds by 21 %, while the effects for mobility are slightly reduced, but are still very large and significant.

Another possible explanation for the large likelihood of disaffiliations in connection with mobility is that church membership is not correctly registered when individuals move. However, whether this is the case cannot be tested with the Taxpayer Panel data set.

[95] An exception is the Land Bremen where disaffiliation is declared at the civil registry office, but must also be declared to the religious community. Since this regulation prevents individuals from disaffiliating when they register their new residence, I treat Bremen as if the disaffiliation takes place at the district court.

Table 4.9: Estimation results for the complete sample with and without a dummy variable indicating the public authority responsible for declarations of church disaffiliation (extract of results for mobility)

	Complete sample		**Complete sample**	
	Model 1a		**Model 1a - extension**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Mobility				
No mobility	*ref.*	---	*ref.*	---
West-West	**1.461**	1208.793 (0.000)	**1.335**	465.895 (0.000)
West-East	**3.505**	1676.500 (0.000)	**3.410**	1378.529 (0.000)
East-East	**2.454**	115.804 (0.000)	**2.392**	109.340 (0.000)
East-West	**0.919**	55.246 (0.000)	**0.804**	37.673 (0.000)
Responsible authority for church disaffiliation				
District court			*ref.*	---
Civil registry office			**0.193**	7.946 (0.005)
Sample size	165,146		165,146	
-2 Log L (constant only)	2,769,469		2,769,469	
-2 Log L (constant and covariates)	2,426,852		2,426,521	
Likelihood-Ratio χ^2	342,617 (53 df)		342,948 (54 df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, price of church membership, income, age dummy, dummy for children, dummy for gender, the interaction of gender and children, main source of income, denomination and regional dummies. Areas shaded in grey refer to variables that are not included in the estimation for the particular model. Bold coefficients are significant at the 1 percent level.

The estimation results show that moving within or into East Germany has a larger effect on the decision to leave the church then moving within or into West Germany. I can only speculate about the reasons. First, it should be noted that inhabitants of Berlin, who exhibit the highest odds of disaffiliation, are counted as East Germans. Consequently, some part of the effect of migration to East Germany could be driven by individuals moving from (possibly more rural) areas to the city of Berlin. Second, it might be true that both the social pressure and the benefits of church membership are perceived to be lower in East Germany, such that the new living situation implies a re-consideration of benefits and costs of membership. This

could explain why moving in the opposite direction, from East to West Germany, has a smaller estimated effect, and is even smaller than moving within West Germany: maybe individuals are aware that church membership is important in some regions of West Germany for integration into the community, for finding a kindergarten or getting a job.

4.7.6 Estimation results for West and East Germany separately

In Table 4.10 I report separate results for my main variables (the price of church membership and income) for the subsamples of West Germany and East Germany, both estimated with the standard operationalization of the price of church membership ("Model 1a"). Based on the complete sample as described in Section 4.5.2, all individuals who lived in one of the West (East) German Länder in 2001 are included in the estimation for West (East) Germany. The results for the complete sample are reported again in order to facilitate comparisons.

Summary statistics for the subsamples of West and East Germany are reported in Table A.1 in Appendix D.1. The complete table of results including all demographic, socio-economic and regional variables can be found in Table A.6 in Appendix D.3. The main hypotheses to be tested in this section are that the effect of church taxes on the decision to leave the church is smaller in East Germany than in West Germany (hypothesis H 11), and that there are no significant differences with respect to demographic, socio-economic and regional variables (hypothesis H 10).

Table 4.10: Estimation results for price of church membership and income for the complete sample and for the subsamples of West Germany and East Germany separately

	Complete sample		**West Germany**		**East Germany**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Intercept	**-2.072**	2535.800 (0.000)	**-2.119**	2373.874 (0.000)	**-1.373**	220.953 (0.000)
Price of church membership						
Price 2001	**0.059**	125.619 (0.000)	**0.061**	111.981 (0.000)	**0.029**	6.927 (0.009)
Dummy Price 2001 positive	0.022	0.5388 (0.463)	0.047	2.107 (0.147)	**-0.187**	7.206 (0.007)
Δ Price	**0.055**	164.905 (0.000)	**0.057**	155.832 (0.000)	0.026	6.456 (0.011)

Income						
Income 2001	-0.000	0.0261 (0.872)	-0.000	0.090 (0.764)	0.001	0.329 (0.566)
Δ Income	**-0.002**	8.334 (0.004)	-0.002	6.521 (0.011)	-0.003	2.739 (0.098)
Sample size	165,146		144,675		20,471	
-2 Log L (constant only)	2,769,469		2,518,574		243,573	
-2 Log L (constant and covariates)	2,426,852		2,205,089		216,683	
Likelihood-Ratio χ^2	342,617 (53 df)		313,485 (51 df)		26,890 (51 df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, age dummy, dummy for gender, dummy for children, interaction of gender and children, main source of income, denomination, regional dummies and mobility. Bold coefficients are significant at the 1 percent level.

4.7.6.1 Price of church membership and income

For the sample of individuals living in West Germany, I find that the previous results concerning the price of church membership are confirmed. Both the price of membership in 2001 and the change between 2001 and 2005 have a significant positive effect on the probability of disaffiliation, thereby lending further support to hypothesis H 1. I also find an economically small negative effect of an increase in income between 2001 and 2005, in particular when I apply model 1d which differentiates between positive and negative changes in the price of church membership (results not shown), which is in line with hypothesis H 2.

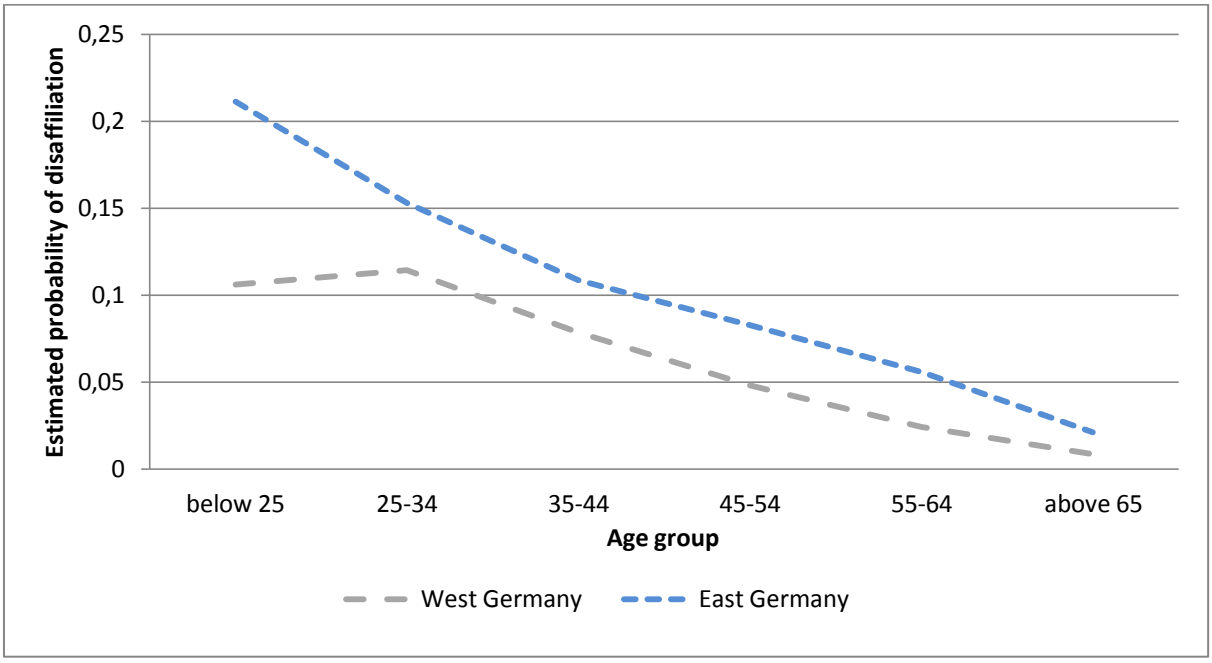
For East Germany, the picture is somewhat different. I still find a significant positive effect of the price of church membership in 2001 and a marginally significant effect of a change in price on the probability to disaffiliate, but the sizes of the effects are smaller than in West Germany. In addition, the dummy variable indicating whether someone has to pay for his or her church membership in 2001 *("Dummy Price 2001 positive")* is significant and negative, suggesting that it is rather the people who do not have to pay for their membership who leave. Only if the church tax is very high, the effect of the amount paid exceeds the effect of the dummy variables and a high cost of membership increases the probability of leaving the church. To summarize, hypothesis H 1 receives mixed support in East Germany: a high price of membership does not necessarily increase the probability of disaffiliation. In turn, this means that hypothesis H 11 is supported, which states that the effect of the price of church membership on disaffiliation is smaller in East Germany.

The income and the change in income are insignificant for the sample of East Germans, but like in West Germany the estimate for a change in income is negative. However, the evidence is not convincing enough to support hypothesis H 2 for East Germany.

4.7.6.2 Demographic variables

The age profiles of disaffiliation are quite similar in both parts of the country, with one significant difference: while in West Germany I find a small and insignificant increase in the probability of disaffiliation from the youngest to the second youngest age group, there is a sizeable and highly significant decrease in the odds of disaffiliation for East Germany. For the other age groups, the developments in East and West Germany proceed similarly. The age effects can be seen in Figure 4.3. This figure was developed by setting the age dummy at each discrete value while keeping all other variables constant at their respective sample averages.

Figure 4.3: Age profile of the probability of church disaffiliation for East Germans and West Germans



Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.

Figure 4.3 clearly shows differences between the two parts of Germany when moving from the youngest to the second youngest cohort. The two graphs also make clear that the probability of disaffiliation in East Germany is above the probability in West Germany in all age groups – always assuming that all other variables are at their respective mean values.

The results suggest that church disaffiliations in East Germany take place at an earlier stage of the individual's life than in West Germany. Hypothesis H 3, which states that the age profile of disaffiliations peaks around age 30, receives some support with respect to West Germany, but not with respect to East Germany.

The gender and children variables and their interaction require a detailed discussion. Hypothesis H 5, which states that men and women without children have the same probability of disaffiliation, is supported for both parts of the country. In contrast, hypothesis H 4, which states that being or becoming a parent decreases the probability of disaffiliation, receives mixed support. The estimated coefficients for men and women in East Germany and women in West Germany are in line with hypothesis H 4, although only some coefficients are significant at conventional levels. However, for West German men H 4 can be rejected.

Hypothesis H 6 receives support in West Germany only: being or becoming a parent has a larger negative effect on the probability of disaffiliation for women than for men. This can be seen from the negative interaction term *"Interaction Gender*Children"* (although it has to be noted that this interaction is significant only in the case of being a parent and having no additional children). However, for East Germany the interaction terms are never significant, indicating no difference in the probability of disaffiliation between men and women when children are present.

To sum up, one can say that having children seems to reduce the odds of leaving the church for most individuals, with the exception of men in West Germany. Gender differences cannot be found for individuals without children. When children are present, gender differences appear to exist in West Germany, but not in East Germany.

4.7.6.3 Socio-economic variables

Another interesting finding is that in East Germany there is no significant difference in the inclination to leave the church between Protestants and Catholics, thereby refuting hypothesis H 7. The estimate for the dummy variable for Catholics is small and even positive, indicating a slightly higher probability of disaffiliation for Catholics in East Germany, but far from any relevant level of significance. In contrast, in line with hypothesis H 7 there is a large and highly significant difference in the probability of disaffiliation between Protestants and Catholics in West Germany.

For West Germany, my findings from the complete sample concerning the main source of income are confirmed: individuals who receive mainly income from agriculture and forestry

or capital income have a low inclination to leave the church, whereas those whose main source of income is from business activity profess the highest probability of dropping out of church. The results reinforce the support for hypothesis H 9. For East Germany, the evidence is mixed. I find that individuals receiving mainly income from agriculture and forestry are least likely to disaffiliate, however, there is no evidence that individuals whose main source of income is business activity are particularly likely to leave the church.

4.7.6.4 Regional variables

Concerning the effects of the region of residence and mobility, the separate regressions repeat the results of the model for Germany as a whole.[96] Interregional mobility is again found to have a significant and positive effect on the probability of disaffiliation. This sustains the support for hypothesis H 13.

To sum up, I find some similarities, but also differences in the variables affecting the church disaffiliation decision in East and West Germany. In particular, I find the price of church membership to be less important for the membership decision in East Germany, which supports hypothesis H 11. In addition, I find that in East Germany the probability of disaffiliation peaks at a younger age and I cannot detect the typical gender roles in the church membership decision when children are in the household, which seem to exist in West Germany. Therefore, hypothesis H 10, which states that church membership decisions do not differ between East and West Germany, is not supported.

4.7.7 Estimation results for Protestants and Catholics separately

The results so far have revealed that Protestants and Catholics differ significantly in the probability of disaffiliation from church – at least in West Germany. However, the results do not reveal whether they differ in their reaction to changes in the price of church membership and income and in the effects of socio-economic and regional variables. Therefore I present separate results for the subsamples of Protestants and Catholics in Table 4.11. Summary statistics can be found in Table A.2 in Appendix D.1. The complete table of results including all demographic, socio-economic and regional variables can be found in Table A.7 in Appendix D.3.

[96] When comparing East and West Germany, one has to keep in mind that at the reference values (which are "North Rhine-Westphalia" and "Saxony" for the variable *"Land"*) the estimated probability of disaffiliation is higher for East Germans compared to West Germans, which can be seen from the difference in the intercepts.

The results in Table 4.11 confirm hypothesis H 7, which states that on average the probability of disaffiliation is lower for Catholics than for Protestants. This can be seen from the difference in the intercepts.

Table 4.11: Estimation results for price of church membership and income for the complete sample and for the subsamples of Protestants and Catholics separately

	Complete sample		**Protestants**		**Catholics**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Intercept	**-2.072**	2535.800 (0.000)	**-1.906**	1342.749 (0.000)	**-2.588**	1940.707 (0.000)
Price of church membership						
Price 2001	**0.059**	125.619 (0.000)	**0.055**	64.995 (0.000)	**0.063**	56.868 (0.000)
Dummy Price 2001 positive	0.022	0.5388 (0.463)	0.058	2.232 (0.135)	-0.020	0.185 (0.667)
Δ Price	**0.055**	164.905 (0.000)	**0.051**	85.550 (0.000)	**0.059**	63.916 (0.000)
Income						
Income 2001	-0.000	0.0261 (0.872)	0.002	1.669 (0.196)	-0.003	1.632 (0.201)
Δ Income	**-0.002**	8.334 (0.004)	-0.001	1.383 (0.240)	-0.004	5.529 (0.019)
Sample size	165,146		86,575		78,571	
-2 Log L (constant only)	2,769,469		1,480,215		1,274,641	
-2 Log L (constant and covariates)	2,426,852		1,310,355		1,108,689	
Likelihood-Ratio χ^2	342,617 (53 df)		169,860 (52 df)		165,951 (52 df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, age dummy, dummy for gender, dummy for children, interaction of gender and children, main source of income, regional dummies and mobility. Bold coefficients are significant at the 1 percent level.

4.7.7.1 Price of church membership and income

Both the price in 2001 and the change in price have a positive and significant effect on the probability to leave the church for Protestants as well as Catholics, which supports hypothesis

H 1 and confirms the results for the complete sample. I find that both estimates are somewhat larger for Catholics than Protestants, but the differences between denominations are not substantial. The estimated coefficients for the variable *"Δ Price"* imply than an increase in the price of membership by 100 euro raises the odds of disaffiliation by 5.2 % for Protestants and 6.1 % for Catholics. However, the marginal effect on the probability of disaffiliation at sample means is 0.37 % for Protestants and 0.30 % for Catholics, pointing towards a somewhat smaller price effect for Catholics. The reason for these divergent results from the odds ratio and the probability is that at sample average values the probability of disaffiliation for Catholics are lower.[97] These findings suggest that hypothesis H 8, claiming that the effect of (a change in) the price of church membership is stronger for Protestants than Catholics, cannot be unambiguously supported. The conclusion depends on which indicators are used to report the results. In addition, the size of the effect is not substantially different, independent from which indicator is used.

I find that the level of income in 2001 and the change in income between 2001 and 2005 negatively affect the probability of disaffiliation, but the effect is economically small and usually insignificant, thereby repeating earlier findings for the complete sample. Concerning the main type of income, the results for Catholics and Protestants are rather similar and in line with the findings for the complete sample.

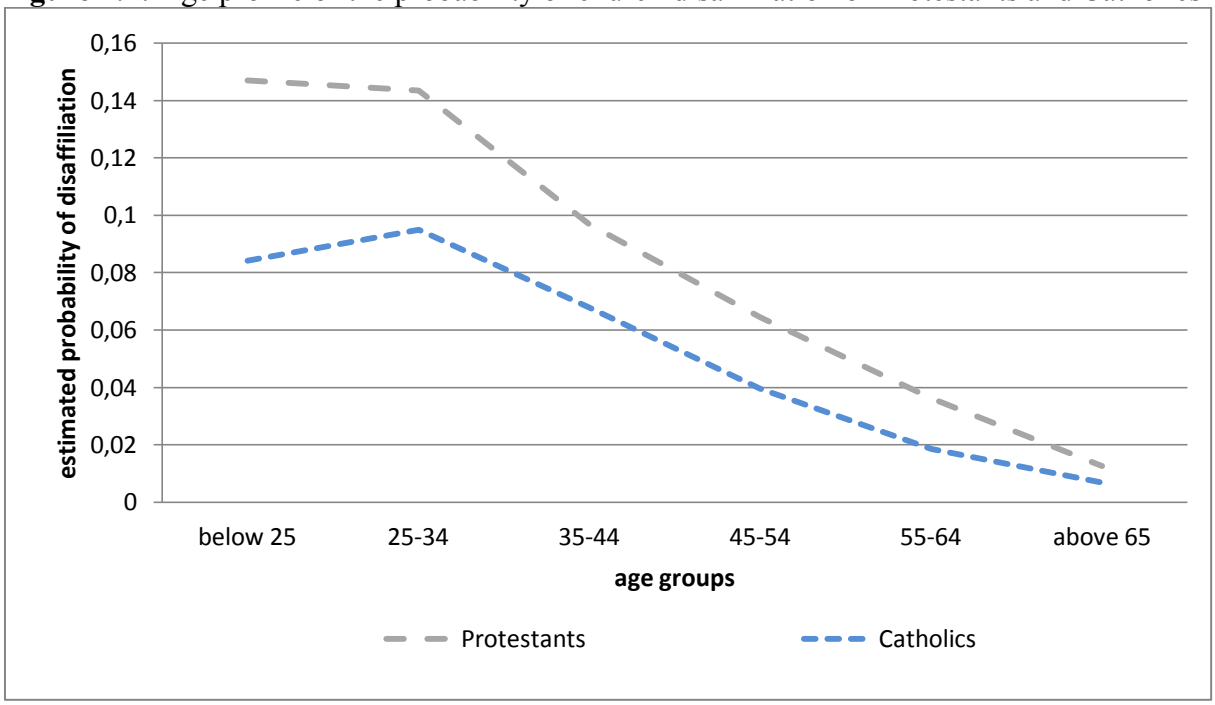
4.7.7.2 Demographic variables

The age profiles of church disaffiliations for Protestants and Catholics can be seen in Figure 4.4. The profiles are produced by setting all variables at their respective sample means, and varying only the age group dummies.

The results clearly show that the probability to leave the church is higher for Protestants than Catholics in all age groups. The estimates indicate that on average disaffiliation from the Catholic Church takes place at a slightly higher age than from the Protestant Church. This can be seen from the moderate increase in the probability of disaffiliation between the youngest and second youngest age group for Catholics, while there is a small and insignificant decrease for Protestants. In sum, there is some evidence for a hump-shaped age profile (hypothesis H 3) for Catholics, but not for Protestants.

[97] Remember that the change in the odds ratio is directly calculated from the estimated coefficient of the respective variable, while the change in the probability also depends on the coefficients and average values of all other variables in the regression.

Figure 4.4: Age profile of the probability of church disaffiliation of Protestants and Catholics



Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.

Concerning gender and children, the overall pattern is similar for the two denominations, but some differences remain. For individuals without children I do not find any gender differences for Protestants, which is in line with hypothesis H 5, and I find that Catholic women without children even have moderately, but significantly higher odds of leaving the church than their male counterparts. Results suggest that fathers have higher odds of disaffiliation than men without children, which contradicts hypothesis H 4. Among Catholics the estimate is highly significant, but for the subsample of Protestants it is only significant at the 5 % level. In both denominations mothers have lower odds of leaving the church than both fathers and women without children, thereby lending support to hypothesis H 6.

4.7.7.3 Regional variables

For both Catholics and Protestants I find that the probability of disaffiliation is highest in the three city states, thereby lending further support to hypothesis H 12. The lowest likelihood of disaffiliation of members of both confessions is found in Thuringia, Saarland, Baden-Württemberg and Rhineland-Palatinate. The relative position of North Rhine-Westphalia (the reference Land) varies according to which denomination one looks at. For Protestants, it shows average disaffiliation rates. For Catholics, the probability of disaffiliation is comparably low in North Rhine-Westphalia, but rather high in East Germany. Despite these differences, the estimates for the Länder dummy variables in the estimations for both

Catholics and Protestants are highly correlated with the percentage of church members and the percentage of Catholics in a Land, but unrelated to the percentage of Protestants (see the data in Table 4.8).

The estimates for mobility are large and highly significant for both denominations, thereby lending support to hypothesis H 13, but all estimates except one are somewhat higher for Catholics than Protestants. This might reflect Catholics' stronger ties to the local parish, which makes interregional mobility a good opportunity to disaffiliate.

4.8 Discussion

4.8.1 Background

The research in this chapter is among the first attempts to evaluate the influence of the monetary costs of church membership on the membership decision, while earlier research has mainly relied on interviews or surveys of either church members or individuals who have left the church. I am aware of only one paper that tries to answer a related research question with the German Taxpayer Panel (Borgloh, 2012), and of one paper that uses a similar data set for Finland to answer this question (Lyytikäinen and Santavirta, 2013).

I motivate my research with a small theoretical model of church membership that accounts for the specific institutional arrangements in Germany – a system where churches mainly rely on taxes for their financing. In particular, I model church membership as a binary decision and account for the fact that church contributions depend on income. The model thereby highlights the importance of controlling for changes in income and the price of church membership simultaneously in order to separate the two effects. My model is more appropriate to explain church membership decisions in an institutional environment with church taxes than previous models such as Azzi and Ehrenberg (1975), where individuals make a discretionary decision on the amount of church contributions, and religiosity is modeled through the time spent with religious activities. As a result, my research also differs from previous studies of church leaving in other countries such as the UK or Australia (Richter and Francis, 1998; Dixon et al., 2007) because most of them look at dropping out of participation rather than official disaffiliation. However, church membership and regular participation cannot be equated, since there is a large number of people in Germany who attend church only sporadically but still do not renounce their membership. In fact, on average only 3.6 % of Protestant church members (Evangelische Kirche in Deutschland, 2011b: 20) and around 13 % of Catholic church members (Sekretariat der Deutschen Bischofskonferenz, 2011: 17) regularly participated in a “normal” Sunday service in 2010.

The precise definition of church membership in Germany, together with the fact that the church membership status is an obligatory statement on the income tax return, facilitates my research. I use the Taxpayer Panel 2001-2006, a large panel data set of German taxpayers. The data set contains information on the church membership status for a large number of German taxpayers for each year, as well as income, church taxes paid and a set of socio-demographic variables. Unfortunately, it lacks data on the education of individuals, which is an important characteristic that is often discussed in studies on religiosity and church

membership (see Engelhardt, von Loewenich and Steinacker, 1997; Te Grotenhuis and Scheepers, 2001; McCleary and Barro, 2006b; Glaeser and Sacerdote, 2008). Because of the large size of the data set, I can research church disaffiliation decisions in some detail, even though it is a rather rare event. Results might also be interesting for other countries such as Denmark, parts of Switzerland or Austria where similar church financing systems are in place. Research on Germany is also instructive because it has a rather heterogeneous religious landscape. On the one hand, there are two major denominations – Catholic and Protestant – which face the same church tax system and have roughly similar membership numbers, but population shares that vary within Germany. On the other hand, there are large regional differences in religiosity and church membership numbers within Germany. In the area of the former German Democratic Republic church members are a minority, while they form the majority of the population in the former Federal Republic of Germany.

4.8.2 Discussion of main findings

My main result in the empirical component is that there is a significant positive, but moderate effect of an increase in the price of church membership on the probability of disaffiliation. Although the result cannot be directly compared to the Finnish study by Lyytikäinen and Santavirta (2013) due to methodological differences, the conclusions are similar: the higher the amount of church taxes someone has to pay, the lower the probability of being a church member. Furthermore, the result that the price of membership is positively correlated to the probability of disaffiliation coincides with the findings of Borgloh (2012) who also uses data from the German Taxpayer Panel. Borgloh (2012) does not measure the price directly; instead she develops an indicator for a price that is too high from the individual's point of view. She argues that church taxes are perfect substitutes for donations. If the exogenously determined amount of an individual's church taxes is too high, i.e. it exceeds the amount an individual would give voluntarily, then he or she will not make any donations. If church taxes increase further, individuals who do not donate will be more likely to drop out of church than individuals who make donations. Borgloh (2012) finds empirical evidence for this hypothesis in the Taxpayer Panel data.

As a robustness test I present a considerable number of different regressions for subsamples. I can show that the effect of the price of church membership on the disaffiliation decision exists with similar magnitude in the subsamples of males and females and Catholics and Protestants. The effect also shows when one looks at church disaffiliations in a single year, however, its magnitude is smaller.

The moderate size of the effect of church taxes on disaffiliation sheds some doubts on earlier research, in particular surveys of individuals who disaffiliated from the church, which often ascribe a very high importance to the costs of membership. However, I cannot test if the mere existence of church taxes induces individuals to disaffiliate, i.e. people leave the church because they disagree in principle with tax financing of religious communities, independent from their personal tax burden. Some earlier research points in this direction. A general resistance against church taxes is considered one of the reasons for the high disaffiliation rates in East Germany when the church tax system was re-established after the German unification (Froese and Pfaff, 2005: 413). Birkelbach (1999: 146) finds that disaffiliation numbers peak when individuals start their first paid job and pay church taxes for the first time. This can, but need not necessarily, be due to the amount they have to pay. It can also be due to the mere fact that church membership is no longer for free.

The smaller estimated coefficients of the church tax variable in the regressions for single years, together with the fact that the level of the price before disaffiliation is always significant, suggests that there is some inertia in the church membership decision. If individuals were perfectly rational, they would immediately react to changes in the price of membership. The price level, which reflects past price changes, should be insignificant. However, the results suggest that individuals react to a change in price with a lag. This is in line with the reasoning of other authors, such as Dubach (1993: 138 [my own translation]): "The [church] member will tolerate a certain amount of disappointments and burdens before he or she decides to disaffiliate". Several explanations for inertia are possible. Maybe there is a lack of information about the calculation of church taxes and individuals are not aware how a change in their income or the income and church tax regulations affects the tax amount. Such a hypothesis is supported by earlier research showing that individuals in Germany only have a limited knowledge about church tax regulations and are often not aware how much they pay in taxes (Köcher, 1993: 17-20; Huber, Friedrich and Steinacker, 2006: 460; Bassler, 2008: 315-319). Another possible explanation is that individuals do not evaluate the costs and benefits of church membership regularly, but only for special occasions, e.g. when they move, start a job or when there is media coverage of religious organizations.

My results concerning income are in line with findings by Lyytikäinen and Santavirta (2013) in that both studies find only a very small effect of income on the church membership decision. However, while my results suggest that individuals with high income are somewhat less likely to disaffiliate, the data for Finland points in the opposite direction. The low

importance of changes in income, but significant effects for changes in the cost of membership, contradict the hypotheses that individuals leave the church when they move upward socially (which often coincides with a higher income), and that the change in the price of church membership which accompanies an increase in income is not the true reason for the disaffiliation. This conclusion is reinforced by one of my regressions which includes different causes for the change in price ("Model 1b"). I show that a change in the price of membership that is caused by a change in church tax rates has a considerably larger influence on the probability of disaffiliation than an increase in price for other reasons, such as a higher income.

I have also tested the effects of a battery of demographic, socio-economic and regional variables on church membership. In line with the hypotheses derived from previous research, I find strong age effects. The likelihood of disaffiliation is highest in the two youngest age groups (below 35 years of age), and then decreases steeply and significantly up to the oldest group. This result is in line with Borgloh (2012) and earlier research on church disaffiliation in various European countries.

Concerning gender, I cannot confirm that women generally have a lower propensity to disaffiliate. In my sample of unmarried individuals who mainly earn their own income, I find that women are as likely to drop out of church as men if they do not have children. This is in line with Lukatis (1991: 126-129) who reports that gender differences in church membership are non-existent or even reversed when one looks at working women.

However, my research points towards traditional gender patterns when children are present in the household. While having children slightly decreases the propensity to disaffiliate for women, it increases the odds for men. This finding parallels the results of a study by Ahrens (2000: 105-106) who finds that having children increases the church commitment of Protestant women in Germany, but slightly (although not significantly) decreases the church commitment of men. Still, in my study the confirmation of Ahrens' (2000) result is quite surprising since the sample only consists of unmarried persons who do not live according to the model of the family proposed by church teachings. Fathers' higher propensity to disaffiliate could also be due to the fact that if parents do not live together, usually children live with the mothers and having children might not play a significant role when unmarried fathers compare the benefits and costs of church membership.

I also find significant and sizable regional differences in the propensity to leave the church. Individuals living in the three city states Berlin, Hamburg and Bremen have the highest probability to opt out of church. This finding lends some support to the hypothesis that even today there are differences in church membership decisions between rural and urban areas. Furthermore, I find a drop in the probability of disaffiliation between the North-East and the South-West of Germany. I also show that in West Germany the estimated odds of leaving the church for both Catholics and Protestants are highly negatively correlated with the share of church members and the share of Catholics in the respective Land, while it is unrelated to the share of Protestants. A similar result has been described by Dubach (1998: 28-29) for Switzerland. He shows that in a community with a large majority of Catholics, the share of non-members is exceptionally low compared to predominantly Protestant or mixed regions. Unfortunately, his study does not allow the detection of whether these differences are due to a low propensity to renounce church membership by Catholics, or to the high share of Catholics that affects members of all denominations. My own research suggests that both channels are important. Catholics have a lower probability to disaffiliate than Protestants, but regional differences remain after controlling for the denomination of the individual. These differences are closely related to the average share of Catholics in the region. The present study does not allow for the detection of how exactly the religious composition of society affects the individual. It might be that this connection is due to cultural traditions (Dubach, 1998: 29), or that in devout regions there is still a lot of social pressure exerted on people who decide to disaffiliate. It might also be the case that the church plays a major role in the everyday social life of individuals and disaffiliation entails significant restrictions in leisure activities, education opportunities for children and job opportunities.

Particularly strong and positive effects on the probability of disaffiliation are measured for people who move between different Länder. The strongest effects are found for individuals who move from West to East Germany. Such a decisive role of mobility in the church disaffiliation process has so far not been described for Germany. However, although the size of the effect is surprising, the finding is in line with research from Switzerland. Dubach (1998: 54-56) reveals that people who have moved within the last five years are less likely to be church members than individuals who have stayed in the same place. The high estimated coefficient of the mobility variables in my research might also be due to the fact that I can only observe mobility between Länder, but not within one Land. Dubach (1998: 54-56) shows that in Switzerland individuals who have moved from one canton to another are less likely to

be church members than individuals who have moved within one canton or who have not moved at all.[98]

The estimated increase in the odds of disaffiliation of individuals living in West Germany and moving to East Germany is higher than for the opposite direction. In addition, the effect is larger for Catholics than for Protestants. This finding could point to the importance of social pressure and role that religious organizations play in the everyday life of individuals. When people move to a different region, they lose the connection to their local parish and possibly also to groups of people or activities that connect them to their local church. Integrating into a new religious community in a different place requires some effort. When individuals move from West to East Germany, they might find that the church plays a minor role in the everyday life in East Germany and there is no social pressure to be a member in large parts of the East German society – thereby reducing the benefits of membership. The higher estimates for Catholics compared to Protestants might be explained through higher social pressure to be a member in predominantly Catholic regions, which makes interregional mobility a particularly attractive opportunity for Catholics to opt out of church.

Furthermore, the data contradict the hypothesis of "slimming" *("Gesundschrumpfen")* of churches. It has sometimes been argued that when the least committed members disaffiliate, the remaining members have a higher church commitment and the propensity to opt out of church abates. However, in those regions where church membership is low – East Germany and the city states – the estimated probabilities of disaffiliation are high. The odds of leaving the church are highly negatively correlated with the share of the population that is a member of the church. And even though the share of church members in East Germany is among the lowest worldwide, it does not appear as if church disaffiliations have come to a halt - quite the contrary seems to be true. Catholics have the same probability of disaffiliation as Protestants in East Germany, although they are a small minority, even among church members. Hence, the present study is in line with previous research (see, for example, Pollack, 2000: 23-24; Schloz, 2006: 54-55) which also shows that – at least in Germany – "slim" churches are not those with the most loyal members.

However, I do find that the price of church membership is less important in East Germany than in West Germany. Although my results show that in East Germany an increase in price has a small positive effect on the odds of disaffiliation, individuals who pay church taxes are

[98] Dubach (1998) only observes church membership, not church disaffiliation. Therefore it is not clear whether individuals leave the church after they have moved; or whether individuals who have left the church at some point are more likely to move later.

found to be less likely to leave the church than those who do not. Consequently, there is some indication that the sensitivity towards church taxes can vary between regions, e.g. if they differ significantly in the conditions of religious life.

In my study I also considered the importance of transaction costs in the church membership decision. In Germany, there are two types of transaction costs. The first is the effort one has to make to declare church disaffiliation, i.e. one has to find out how declaring church disaffiliation works, where to go (civil registry office or district court) and what to bring and then go there during opening times. The second type of costs are the fees one has to pay for disaffiliation.

In order to find out whether going to the state authority in order to declare disaffiliation is a significant type of transaction cost, I used the fact that in some Länder disaffiliation has to be declared at the civil registry office, in others at the district court. When individuals move, they have to register at the registration office, which is – at least in small cities – usually at the same premises as the civil registry office, therefore transaction costs of declaring church disaffiliation are low. In contrast, going to the district court is an additional effort, irrespective of whether someone moves. Therefore I include a dummy variable in my estimations that indicates for all individuals who move whether they move to a Land where church disaffiliation must be declared at the civil registry office or the district court. I find that the dummy variable is significant, indicating that individuals who can more easily declare disaffiliation when moving have a higher probability of disaffiliation. However, the size of the effect is moderate, especially when compared to the large effects of mobility in general. In addition, when looking at individuals who do not move one cannot see that the estimated coefficients for the Länder are correlated with the responsible authority, although going to the civil registry office should be less costly (in terms of time) than going to the district court.

I also investigate whether the fee for disaffiliation prevents individuals from opting out of church. This is done by correlating the fees in each Land with the estimated regression coefficients for the Länder dummies. There is a moderate negative correlation for West German Länder, i.e. disaffiliation rates are low where the fee is high. For East Germany I do not find any evidence that fees prevent individuals from disaffiliating. In sum, there is at best moderate evidence that transaction costs, in particular fees, matter. However, the fees are comparably low, especially if they are contrasted with the average amount of church tax per year. The mild negative correlation of fees and the odds of disaffiliation might also reflect the

religiosity of the average citizen or the regional government, in that fees are fixed at a higher level where church disaffiliations are socially less acceptable.

While I find moderate evidence for the importance of transaction costs, results for Finland by Lyytikäinen and Santavirta (2013) imply that transaction costs can have a large influence on church disaffiliation rates. The authors investigate the implications of a change in the Finnish law which made church disaffiliations easier. Before the new law was introduced in 2003, individuals had to declare their church disaffiliation in person and had to face people working for the church. After the change, disaffiliation could be declared via email or even via a website. The authors find that after the introduction of the website the probability of disaffiliation of church members increased by 730 %.

Even in Germany there is some discussion that transaction costs matter for the church membership decision. Since it is in the interest of the church to have as many people as possible who rejoin the church, the Protestant Church has come up with some ideas how to make this as easy as possible. They have founded centers for re-affiliation *("Wiedereintrittsstellen")* where individuals can go to (instead of going to their local parish). Re-affiliation in those centers requires little time and church personnel are encouraged to be positive about people who have found their way back to the church instead of blaming them for disaffiliating. The evaluation of the centers for re-affiliation is generally positive. (Kirchenamt der EKD, 2009) Statistics show that there are far more people who re-affiliate in the Protestant Church compared to the Catholic Church, although I am not aware of any research that investigates whether this difference is due to transaction costs.

4.8.3 Suggestions for further research

Further research could attempt to use data sets similar to the German Taxpayer Panel or the data used by Lyytikäinen and Santavirta (2013) in other countries with church tax systems, such as Sweden or Switzerland, in order to produce internationally comparable results and to investigate whether there are country differences in the attitudes towards church taxes.

It is also possible to apply different estimation strategies. While I have chosen a logit model and Borgloh (2012) employs a probit model (which is quite similar to a logit model in various ways), the authors of the Finish study use a fixed effects linear probability panel model. The estimation strategy used in the Finnish paper could be applied to the German data set to enable the comparison of results.

It might also be fruitful to do research on the price sensitivity of church membership with the help of a natural experiment, such as an increase in the church tax rate in one federal state. In recent times, there were only smaller changes in the tax regulations, such as adjustments of the maximum tax rate. The only increase in the church tax rate which I am aware of took place in Hamburg where the church tax rate was raised from 8 % to 9 % in the beginning of 2001, such that I do not have data for the years when the tax rate was still 8 %. It might also be interesting to find out if the new tax treatment of pensions causes more elderly people to leave the church. Many pensioners did not have to pay income tax (and church tax) until 2004, but since 2005 their pensions are subject to income tax (and church tax). However, the Taxpayer Panel is not suitable to investigate this question since individuals who did not pay taxes before 2005 are not included in the data set.

In addition, the research of church membership ideally lends itself to a duration analysis. Such an analysis asks for how long it takes until an event (church disaffiliation) occurs and why it occurs earlier with some people, and later or not at all with others. The main reason why this type of analysis is not carried out here is that my data is heavily left-censored, i.e. I do not know what happened to the individuals before 2001, how long they had been church members, how high their income was, how much tax they had to pay, etc. Without such information, estimation of duration models makes little sense. However, if a dataset were available that allowed following people from childhood or church affiliation through their lives, duration models should be applied.

Furthermore, the German data set allows investigating church membership decisions for married individuals. I have refrained from doing so because church membership choices of married couples arguably tend to be collective decisions of the partners and depend of the characteristics of both spouses, such as their incomes and labor force participation. While the partner with the higher income (usually the husband) leaves the church to save church taxes, the wife keeps in touch with the religious community (Daiber, 1995: 168) and therefore provides the opportunity for the children to become involved with the church as well (Birkelbach, 1999: 141). Consequently, the choice opportunities for married couples cannot be compared to those of single individuals. Research on married couples could for example ask if married couples do actually choose arrangements that maximize benefits of membership and minimize the costs for the family. It could also investigate whether gender differences in the propensity to disaffiliate do exist when individuals are married and it could test whether married individuals are less sensitive towards changes in the price of church

membership than singles, as appears to be the case in Finland (Lyytikäinen and Santavirta, 2013).

Apart from the contrast between singles and married individuals, the Finnish study has also revealed that younger people react more strongly to a change in church tax than older individuals and that there are differences in the price sensitivity of church membership between the capital region and more rural areas. My own research has shown that there are differences in the effect of the price of church membership on disaffiliation between East and West Germany. However, it might also be interesting to compare rural and urban areas. I also looked at Protestants and Catholics separately, but - surprisingly - could not find sizeable differences in the price sensitivity. The data set would also allow investigating the church disaffiliation decisions of different age groups. Such research could help religious organizations when they consider changes to the church tax regulations in order to increase revenues. If the Finnish finding of a very low price sensitivity of elderly church members could be repeated for Germany, a heavier taxation of elderly individuals would be a viable option.

The data set could also prove useful to investigate the effect of significant life events such as marriage or divorce on church membership, since data on both church membership and civil status is available for all taxpayers in the sample, i.e. for a very large sample. Such a study could complement earlier research on the effects of these life events on religious participation (see, for instance, Lois, 2011b).

Another fruitful path for further research is the focus on transaction costs. Unfortunately, in Germany there is not much variation in transaction costs that could be exploited, neither between Länder, nor over time. However, there is some variation in the fees for disaffiliation: North Rhine-Westphalia introduced a fee of 30 euro in 2006, Bremen introduced a fee of 5 euro in 2009 and Thuringia introduced a fee of 30 euro in 2009 – all three Länder did not have a fee before. If one is interested in the effects the introduction of such a fee has on disaffiliation rates, one should also look at parts of the population which are underrepresented in my sample, such as students or individuals with low income. This is particularly interesting since one would expect them to be more likely to find the monetary costs of disaffiliations prohibitively high. In addition, it could be instructive to look in more detail at individuals who move (not only between Länder) and investigate whether moving and the associated paperwork reduces transaction costs or if there are other aspects of mobility that explain the extraordinarily large effects on the odds of disaffiliation that I find in my sample.

Finally, future research could investigate the consequences of church disaffiliation for individual behavior, such as donating money, volunteering or the accumulation of social capital. Up to now, researchers have only compared members and non-members, e.g. with respect to their giving behavior. However, it is unclear if this behavior changes during the process of disaffiliation.

5 VOLUNTARY GIVING IN GERMANY – THE ROLE OF CHURCH TAXES AND CHURCH DISAFFILIATION

5.1 Introduction

In the previous chapter I have tested the hypothesis – derived from the model in the Chapter 3 – that the price of church membership has an effect on the church membership decision. This hypothesis was supported, although the effect is moderate.

In this chapter I go a step further and test the second set of hypotheses derived from the theoretical model in Chapter 3, which concern voluntary giving behavior as one example of a behavior that might be affected by the design of the church tax system and the church membership decision. The theory in Chapter 3 as well as the empirical estimations in the current chapter are based on the assumption that the amount paid as church taxes and voluntary donations are (probably imperfect) substitutes. This assumption draws upon various studies from Germany which reveal that the social services the church provides (for example for the poor, the elderly and the sick) are one of the most important reasons for being a church member and are expected by church members (Institut für Demoskopie Allensbach, 1993: 40; Schloz, 2006: 60-61; Leis-Peters, 2010: 105-108).[99]

Against this background, one expects that church members and non-members differ in their giving behavior since the former are forced to make a charitable contribution in the form of the church tax. In addition, church disaffiliation should affect the giving behavior since individuals are no longer forced to pay church taxes, which leaves them with a higher available income, but also with the responsibility to actively make a donation if they are motivated by altruistic or "warm glow" considerations. Furthermore, the discussion in Chapter 3 suggests that voluntary giving to religious organizations and to secular organizations could be affected differently by church membership and church disaffiliation.

In order to answer the research questions I use the same data set as in the previous chapter – the Taxpayer Panel for the years 2001 to 2006. I apply estimation equations that are often used in the literature on voluntary giving, but pay special attention to measuring the influence of church membership and disaffiliation.

[99] However, even church-related publications (Hermelink, 2008: 113; Resing, 2011: 3) point out that the share of these services that is financed through church taxes might actually be over-estimated by church members.

The remainder of this chapter is structured as follows: in Section 5.2 I state my research questions and develop the hypotheses and in Section 5.3 I review the existing literature on voluntary giving with a focus on church membership. The data set and the definitions of variables are discussed in Section 5.4 and the estimation methods are introduced in Section 5.5. The results are presented in Section 5.6 and discussed in Section 5.7.

5.2 Research questions and hypotheses

My research questions all concern the interrelation of voluntary giving (where voluntary giving is giving exclusive of church taxes) and church membership. The hypotheses are mainly derived from the model in Chapter 3.

My first research question is:

> *Do church members and non-members differ in their giving behavior, i.e. their probability to give and the amount given?*

From the considerations in Chapter 3 one can derive the following hypothesis: After controlling for income, church members are both less likely to give and they give less than non-members. The reason is that church members who pay church taxes (i) face reductions in the available income that they can freely allocate to voluntary giving and (ii) they already make a contribution to a (religious) charitable cause if the assumption is true that church taxes are (at least partly) perceived as a charitable contribution. The effect at the extensive margin, i.e. whether someone makes a contribution at all, is predicated on the observation that for some church members church taxes can be so high that they exceed the amount which they would give voluntarily, such that individuals are in a corner solution where they do not make any additional charitable contributions. Even when they are in a regular solution, one would expect the amount given to be lower for church members. When one considers religious and secular giving separately, then all individuals should be equally likely to give to secular causes, irrespective of their church membership status, but non-members are expected to give more. The reason is that the church tax is not a substitute for contributions to secular charitable causes, but it reduces the freely available income of the individual. Looking at religious causes, the model in Chapter 3 predicts that non-members are more likely to give and give more than church members.

However, the hypothesis crucially depends on an assumption made in the model. I assume that church members and non-members have on average the same marginal utility from giving, characterized by β_1 and β_2. In other words, they are equally altruistic or derive the same utility from their contributions, both religious and secular. However, this assumption need not be valid. The group of non-members in my sample consists of individuals who have never been church members and of individuals who have left the church before 2001. Those who have not been raised religiously may not have been exposed to religious doctrine, which is often very favorable of charitable acts, and have never been part of a religious community

which exerts social pressure to give to charitable causes. Furthermore, even among those who have been a church member at a young age, the preferences with respect to voluntary giving might differ from current church members. The model in Chapter 3 predicts that *ceteris paribus* those individuals who derive very little utiliy from (religious) giving and thus from paying chuch taxes have the highest probability to leave the church. Therefore the group of non-members might be biased toward individuals with a low preference for giving.[100] In turn, current church members might have systematically higher preference parameters β than non-members, which implies that their probability to give and the amount given could be equally high or even higher than that of non-members.

To sum up, the first research question is geared toward examining differences between individuals. The hypothesis is that church members and non-members differ in their voluntary giving because the former are obliged to make charitable contributions in the form of church taxes. However, systematic differences in the preferences for charitable giving might dilute the expected effects of church membership.

Therefore the second research question refers to changes within individuals over time. If church membership and paying church taxes affect giving, one might suspect that the giving behavior changes during the process of disaffiliation, i.e. from the time (shortly) before to after disaffiliation. Thus, research question number two is:

Does voluntary giving behavior change during the process of disaffiliation?

The hypothesis is that individuals are both more likely to give and to give more after they have left the church and are no longer obliged to pay church taxes. The reasoning is the same as with respect to the first research question. The longitudinal view might be interesting since within individuals preferences (captured in β_1 and β_2) can be assumed to be more or less stable, while they may differ between individuals. When looking at religious and secular giving separately, one expects individuals to start giving to religious causes (if they were in a corner solution as a church member, i.e. they did not make any contributions) or to increase their religious giving. Concerning secular contributions the model in Chapter 3 predicts an increase in giving.[101]

[100] This argument is further explored in the discussion concerning the third research question below.

[101] In the model in Chapter 3 church taxes are by assumption a substitute for religious voluntary contributions, but not for secular giving. Therefore individuals can be in a corner solution with respect to religious giving, i.e. the amount of church tax they pay exceeds the amount they would give voluntarily. Without the obligation to pay church taxes, these individuals may start making voluntary religious contributions. With respect to secular giving, no corner solution exists; therefore individuals do not have an incentive to start giving after disaffiliation.

Research question number three is geared toward the motivation for church disaffiliation:

> *Do individuals who drop out of church differ in their giving behavior from "regular" church members, i.e. from church members who do not disaffiliate in the near future?*

From the model in Chapter 3 it is not possible to derive a hypothesis. Whether individuals who disaffiliate differ in their giving behavior from those who stay, and in which way they differ, depends on the reason why they opt out of church. In the model, I identify three possible motives. The first motive is that they have a lower membership benefit. If this is the case, one can expect them to be as generous as "regular" church members, with respect to both religious and secular causes.[102] Second, they might have a lower fitting parameter a, i.e. they agree less to the use of tax revenues by the church than "regular" church members do. In that case, they should give even more in total than members who do not leave, since they would try to make up for the church tax money that is "wasted" from their point of view with additional voluntary giving. When looking at religious and secular giving separately, the hypotheses are that they give more to religious causes, but somewhat less to secular causes than "regular" members. Third, if individuals who disaffiliate have a lower average marginal utility from giving, i.e. lower levels of β_1 and β_2, then the hypothesis is that they are less likely to give and give less than "regular" members. Such individuals disaffiliate because church taxes are simply too high for them, not primarily because they do not like how they are spent. Although in the model framework low levels of β_1 and/or β_2 can induce individuals to leave the church, one would rather expect those who drop out of church to have a small marginal utility from religious giving, i.e. a low β_1, which would in turn imply that those individuals are less likely to give and give less to religious causes.

The fourth and last research question refers to the general differences between religious and secular giving and goes beyond questions of church membership and disaffiliation. I ask:

> *What are the price and income elasticities of the two types of giving, and do they differ systematically?*

This question is beyond the scope of the considerations in Chapter 3. However, there is one hypothesis which can be derived from the model: The income elasticity of religious giving

[102] In the model in Chapter 3 membership benefits and the preference parameters β_1 and β_2 are independent. Furthermore, membership benefits do affect the church membership decision, but not the giving decision. If individuals who leave the church and those who stay only differ in membership benefits, they should be equally likely to give and give the same amount.

should be smaller than that of secular giving, since rising income leads to higher church tax payments, which are a (possibly imperfect) substitute for voluntary religious giving.

5.3 Literature review

The main focus of this chapter is the interplay of religion and voluntary giving. However, the research methods in this sub-field of the voluntary giving literature are the same as in the general research on voluntary giving. Therefore I will briefly review the empirical literature on voluntary giving, which is mainly focused on the price and income elasticities of charitable contributions. However, I will not provide a theoretical discussion of why individuals make donations. For an overview of the topic, the reader is referred to Schokkaert (2006) and von Kotzebue and Wigger (2010). After a short introduction to empirical research on voluntary giving, I will discuss results on the connection between religion and giving.

5.3.1 Empirical research on voluntary giving

Empirical research on voluntary giving using tax data was introduced in the economic literature by Taussig (1967) (Andreoni, 2006: 1235). Taussig (1967) still influences today's research since he was the first to use the log-log specification in voluntary giving research: he regressed the log of the amount of donations on the log of the price, the log of income and a set of demographic variables,

$$\ln g_i = \alpha_0 + \alpha_1 \ln p_i + \alpha_2 \ln y_i + AX_i + \varepsilon_i \tag{5.1}$$

where g_i is the donation of individual i, p_i is the price of giving, y_i is the income of the individual, X_i is a set of demographic variables and ε_i is an error term. The advantage of this specification is that α_1 and α_2 can be interpreted as the price and income elasticity, respectively. (Andreoni, 2006: 1235)

Most of the literature on voluntary giving is concerned with estimating the price elasticity of voluntary giving. The price of giving is defined as one minus the marginal tax rate, because in many countries, including the US and Germany, donations are tax-deductible, i.e. the taxable income is reduced by the amount donated, which in turn reduces the tax burden of the individual. In other words, the state subsidizes voluntary donations by renouncing a part of its tax revenues. Of course, such a policy is only efficient if the increase in donations fostered by the tax deductibility of donations exceeds the shortfall in tax revenues by the state (Peloza and Steel, 2005: 261; List, 2011: 170). Therefore efficiency requires giving to be elastic, which is equivalent to saying that the absolute value of the (negative) price elasticity is greater than one (Peloza and Steel, 2005: 261; List, 2011: 170).

Subsequent research has extended knowledge on the empirics of voluntary giving in various directions (Schokkaert, 2006: 145). Researchers have used different data sets and a large variety of estimation techniques. Both cross-sectional and panel data have been used. Panel data is to be preferred to cross-sectional data, especially if there have been exogenous changes in the tax treatment of donations, since it allows the disentangling of the reaction to a change in price from the effects of other (possibly unobservable) variables such as income and marital status, which also influence the price of giving (Barrett, 1991: 366; Peloza and Steel, 2005: 261-262). Researchers often use OLS estimation techniques; however, the problem is that there is usually a large share of individuals who have zero donations. Such a quality of the dependent variable asks for estimation techniques for limited dependent variables, e.g. Tobit estimation (Andreoni, 2006: 1235). However, Tobit analysis also has some drawbacks: first, one has to make the assumption that exogenous regressors have the same influence on the decision to give at all and the amount given; second, panel data methods, most notably fixed effects estimation, is not readily available.

Recent contributions to the literature are also concerned with obtaining a more detailed picture of income and price elasticities: researchers try to disentangle transitory and permanent income and price effects.

Results, which are heavily based on US data, suggest that the income elasticity of giving is positive, but appears to be below one (see literature reviews in Schokkaert, 2006: 146-152; Bekkers and Wiepking, 2007: 9). Peloza and Steel (2005) conduct a meta-analysis of estimates of the price elasticity of voluntary giving and find that the mean elasticity is -1.44; or -1.11 when data is corrected for outliers (Peloza and Steel, 2005: 265). In other words, giving is price-elastic. While Peloza and Steel (2005: 267) cannot find significant differences between transitory and permanent price elasticities, Andreoni (2006: 1236-1240) reviews two influential studies that do find these differences: while Randolph (1995) finds an inelastic reaction to permanent price changes and an elastic reaction to transitory changes in price, which is in line with expectations, Auten, Sieg and Clotfelter (2002) come to the opposite conclusion – using the same data set. Both papers suggest that the permanent exceeds the transitory income elasticity. A recent paper by Bakija and Heim (2011) supports the findings of Auten, Sieg and Clotfelter (2002), i.e. permanent changes in price lead to an elastic reaction, while transitory changes do not.

A possible shortcoming of most of the literature is that the dependent variable in empirical estimations is the sum of all donations. Different causes of giving are not considered

(Schokkaert, 2006: 144), which reveals the implicit assumption that the price and income elasticities of all types of giving are the same. There is a small, but growing literature that looks at different kinds of giving separately. In the majority of these studies, considerable interest is given to religious giving, probably because giving to religious organizations makes up by far the largest share of giving in the US (see List, 2011: 162-163).

In what follows, I will briefly review the empirical literature on religiosity and voluntary giving.

5.3.2 Religiosity and voluntary giving

The literature on religiosity and voluntary giving deals with different, though associated questions. The first question is whether religious individuals are more or less generous than non-religious individuals. Such literature often finds that religious people give more. In the next step, researchers are interested in whether religious individuals are equally generous with respect to different kinds of giving, or if they only give to religion but neglect charitable and secular causes. In this regard, the main research question is whether religious and non-religious giving can be considered substitutes or complements. In addition, some authors try to characterize religious and secular giving, i.e. they try to estimate and compare price and income elasticities of different kinds of voluntary contributions. To sum up, the focus of the research can either be on the person who gives and his or her religiosity, or on the organization that receives the contribution and whether it serves religious or non-religious causes. In some parts of the research, the two perspectives overlap.

5.3.2.1 Joint determination of religious and secular giving

A large empirical literature, especially from the US, explores how religiosity influences voluntary giving of time and money. Researchers consistently find that more religiously involved people are more prone to give, for secular as well as religious causes (Hodgkinson, Weitzman and Kirsch, 1990; Regnerus, Smith and Sikkink, 1998; Lam, 2002; Brooks, 2003; Bekkers and Schuyt, 2008). There are two main mechanisms that cause the higher altruism of religious persons: "conviction" and "community" (Bekkers and Schuyt, 2008: 76-80; Bekkers and Wiepking, 2011: 944, see also Nemeth and Luidens, 2003: 108). The "conviction" explanation emphasizes that altruism is an important element in the teachings of most religions and helping others is considered as an integral part of living one's faith. Reading the bible, experiencing altruism from (members of) religious institutions or feeling the need to spread the self-experienced love of God might result in high intrinsic preferences for altruism (Pessi, 2011: 8-11). At the same time, religious people might be pressured by the

"community" to profess a high level of altruism because they are asked to contribute more often and only achieve a high reputation and acceptance in the religious community if they give freely. In the terms of the model in Chapter 3, both explanations amount to the fact that religious individuals have a higher marginal utility of giving, expressed through β, than non-religious individuals.

Researchers usually find evidence for the "community" explanation. Denomination and attendance at services lose their significance for secular giving and volunteering and may even have a negative influence when giving or volunteering for church-related activities is added as an explanatory variable (Jackson et al., 1995; Lam, 2002; de Hart and Dekker, 2005). In contrast, Bekkers and Schuyt (2008) find that secular giving is also strongly related to altruistic values, which supports the "conviction" theory.

However, both explanations require that individuals are religiously involved in one way or another. It is therefore not surprising that differences in giving between the non-affiliated and nominal members hardly exist after controlling for church attendance (Regnerus, Smith and Sikkink, 1998; Scheepers and Te Grotenhuis, 2005; Lyons and Nivison-Smith, 2006).

Results for Germany confirm that on average church members give more to charity than non-members (Borgloh, 2008; Bönke, Massarrat-Mashhadi and Sielaff, 2013). A more thorough investigation reveals that the percentage of giving households among church members is significantly higher than among non-members. For example, only 20 % of jointly assessed couples who are not members declared donations in their income tax returns in 2001, in contrast to 48 % of couples consisting of two church members. However, the average amount of donation declared by taxpayers who reported a positive amount of giving is significantly higher for non-members than church members. (Buschle, 2009: 99-102) [103] A major shortcoming of some German studies is that they rely on tax return data, but do not account for itemization status. Because church taxes are itemized deductions in Germany, almost all church members are itemizers, while most non-members are not. However, itemizers have an incentive to declare all donations, while non-itemizers have no incentive to declare small donations. Therefore one would expect the percentage of households giving to be higher and the average amount of giving declared to be lower for (itemizing) church members – irrespective of their actual giving.

[103] The study by Buschle (2009) reports only frequency cross tabulations. It is therefore unclear how much of the differences in giving between members and non-members can be explained by income and other socio-economic or demographic variables.

If religious and secular giving were indeed determined by the same underlying motivation (high altruism or social pressure), then they should also be positively correlated. In several empirical studies, both from the US (Clain and Zech, 1999; Lam, 2002) and other developed countries (Carroll, McCarthy and Newman, 2005; Chang, 2005; de Hart and Dekker, 2005) religious giving or volunteering is used as an explanatory variable for secular giving/volunteering, or vice versa. Researchers usually find a positive and significant effect. There are also some contradictory results from the US, which suggest that for low-income households, religious and secular giving are negatively correlated, at least at the extensive margin. Showers et al. (2011) show that households that give to religion give a higher amount to charities and vice versa, but they also find that giving to religious organizations (charity) decreases the *probability* of giving to charities (religion) for low and medium income households. James and Sharpe (2007) find that individuals with a low income are more likely to give only to religious causes, while individuals are more likely to give to secular causes or both when they have a higher income. They argue that there is a "sect effect" in religious giving, i.e. individuals with below average income and education, who are usually less generous givers, contribute disproportionally to religious causes.

Putting the overall finding of the literature in relation to my hypotheses, the research results suggest that on average church members may have a higher marginal utility of giving than non-members. This contradicts the assumptions which underlie my theoretical model in Chapter 3 and casts doubts on the hypotheses derived from the model, in particular with respect to research question one in Section 5.2. If church members on average have a higher utility from giving than non-members, the former may be more likely to give or make higher voluntary contributions even though they already make a charitable contribution by paying church taxes.

However, it is difficult to transfer the conclusions from the literature to my second research question, i.e. how giving changes during the process of disaffiliation. The reason is that the research designs differ. In the literature cited above, individuals can freely determine the amount they give to religious and secular causes. The predominantly positive empirical correlation between the two types of giving is most likely due to the fact that preferences for giving differ between individuals and people who have a high preference for religious giving also have a high preference for secular giving. In my research individuals who leave the

church experience an exogenous variation in religious giving (reduction in church taxes)[104] while preferences can be assumed to be more or less stable. Therefore I expect to see an increase (rather than a decrease) in voluntary giving when the obligation to pay church taxes no longer applies.

The only research I am aware of which makes use of the fact that in church tax systems church taxes are exogenously determined in order to test whether they are substitutes for other charitable donations is Borgloh (2009, 2012). She uses the same data set that I use, the German Taxpayer Panel. She employs the standard estimation equation for voluntary giving (see equation (5.1)), but restricts the sample to church members and adds the amount of church taxes they pay as an independent variable in the estimation equation. Borgloh (2012) finds that an increase in church taxes significantly *increases* the probability and amount of charitable giving, i.e. church taxes and donations are complementary. However, she also exploits differences in church tax rates between the Länder in Germany. Her results indicate that individuals living in a Land where the church tax rate is lower make higher donations, which implies that church taxes and voluntary charitable contributions might be substitutes.

My own research in this chapter is similar to Borgloh (2012) in some respects since the research design was established and most of the empirical estimations conducted before Borgloh's (2012) work was published. However, my research also differs in many respects. First, I do not include the amount paid as church taxes in the estimations of voluntary giving; instead, I use the fact that there is a largly exogenous change in the church tax payment when individuals disaffiliate from the church. Second, my research interest is also in the giving behavior of marginal church members, i.e. those who will leave the church in the following years. Third, I provide a more comprehensive overview over different estimation methods than Borgloh (2012). Fourth, I look at two types of giving that I can distinguish in the data set, one purely secular and the other including religious contributions, while Borgloh (2012) only looks at the sum of donations.

5.3.2.2 Income and price elasticities of religious and secular giving

The income of the donor and the price of giving are important determinants of religious and secular charitable contributions. If various kinds of giving have different underlying motivations of donors, this could cause differences in price and income elasticities (see List, 2011: 165). List (2011: 165) argues that religious giving might be driven by afterlife

[104] Although the decision to leave the church is endogenous, the reduction in church tax is exogenous to the individual since he or she cannot determine the tax amount.

consumption motives or that religious contributions could be seen as social insurance. One could claim that in order to maintain the insurance and to ensure afterlife consumption, regular religious contributions need to be made. As a result, religious giving might be less price and income elastic than secular giving, which is usually motivated by altruism (concern for the welfare of others), warm glow or social prestige considerations.

Feldstein (1975) was among the first to estimate the income and price elasticities of different types of giving. He finds that giving to religious organizations is inelastic in price, while donations to all other types of charity (educational institutions, hospitals, health and welfare organizations) are highly elastic. The income elasticity of religious giving is also at the lower end of the range of estimates.

Kitchen and Dalton (1990) use Canadian data and a Tobit analysis. They find that overall giving has a price elasticity that is slightly below -1, but religious giving is highly price elastic. In contrast, total giving is estimated to be income elastic, while religious giving is not. Using another data set from Canada, Kitchen (1992) contradicts the results of Kitchen and Dalton (1990). He finds a higher price elasticity of overall giving, but the price elasticity of religious giving is not significantly different from zero. Recent research from Canada (Hossain and Lamb, 2012) suggests that religious giving in inelastic to changes in price, while other types of giving (total giving, health, social services) are price-elastic.

Brooks (2007) uses data on a cross-section of households in the US for the year 2001. He finds that different types of charitable giving differ in income and price elasticities. Religious giving has lower income and price elasticities than combination charities and giving to the poor, but is more elastic than giving to health or education. While all price elasticities are significant, the income elasticity of religious giving (and some other types of giving) is not.

Helms and Thornton (2012) use the same data source as Brooks (2007), but look at a panel with waves from 2001, 2003 and 2005. They separate giving into religious and secular giving, where religious giving only includes giving directly to religious organizations and excludes giving to charities run by religious organizations. The authors use fixed effects estimation and find that both the income and price elasticities of religious giving are smaller than those of secular giving. The authors also research the extensive and the intensive margin separately, i.e. the decision to give at all and the amount given, and find that at the extensive margin results are in line with expectations, but at the intensive margin religious giving appears to be more price elastic than secular giving (but less income elastic). The results of a higher price

and income elasticity of secular giving are confirmed when one compares religious giving of religious households and secular giving of nonreligious households. However, the picture is less clear when one looks at secular giving of religious households and religious giving of nonreligious households. For example, the results show that nonreligious households do not react to changes in price and income when they decide about whether to give to religious organizations. Helms and Thornton (2012) also show that the largest difference in the price elasticity of religious and secular giving can be found for donors who give amounts between 100 and 500 dollars, while it is small or non-existent for households making very small or very large contributions.

List (2011: 165) looks at aggregated giving and regresses percentage changes in voluntary giving in the US on changes in the S&P 500 index of the previous year. He finds that religious giving is nearly unaffected by the economic situation, while other types of giving vary significantly in accordance with the S&P 500 index.

Hrung (2004) uses nationally representative survey data from the US from 1999. He looks at religious and secular giving separately and finds that both types of giving increase in income (he uses dummy variables for 5 income groups), but the effect is larger for secular than religious giving. This coincides with another of Hrung's findings, namely that the share of religious giving in total giving decreases when income rises.

Yen (2002) provides more detailed results, both because he looks at more detailed types of giving and because he can actually estimate price elasticities. The author uses cross-sectional data from the 1995 Consumer Expenditure Survey in the US and separates giving into religious giving, giving to charity and other giving. He finds that the overall income elasticity of religious giving is above one and about the same as that for other giving, but somewhat smaller than that for charitable giving. At the extensive margin, religious giving has the lowest income elasticity. Another study based on the US Consumer Expenditure Survey, but with data from the year 2004, is Showers et al. (2011). The authors agree with Yen's (2002) results in that religious giving has the lowest income elasticity of all types of giving at the extensive margin and that the overall income elasticity of religious giving is lower than that of charitable giving. In contrast to Yen (2002) they estimate the overall income elasticity of religious giving to be far below one. Charitable giving is income elastic for medium and high incomes, but inelastic for low incomes.

Lunn, Klay and Douglass (2001) support the hypothesis that religious giving is less income elastic than non-religious giving with a data set restricted to members of the Presbyterian Church in the USA. The authors look at four types of religious giving: "regular giving to the local congregation, giving to special campaigns at the local congregation, giving to denominational appeals, giving to religious groups or causes outside the Presbyterian Church" (Lunn, Klay and Douglass, 2001: 766). All types of religious giving have an income elasticity of close to one, while non-religious giving is more income-elastic.

To sum up, there is a consensus in the literature on voluntary giving that price and income elasticities differ between contributions to various causes. The majority of studies find that religious giving is less elastic, in particular at the extensive margin.

5.4 Data

The research questions will be answered empirically using the Taxpayer Panel, a 5 % stratified random sample of all individual tax returns in Germany for the years 2001 to 2006 provided by the German Federal Statistical Office. The data set includes all information stated in income tax returns, most importantly declared donations and different definitions of income. It also contains personal details, such as church membership and denomination, gender, civil status, age, number and age of children, and federal state of residence. The data set is balanced, i.e. it includes only data for those taxpayers who filled out their tax returns in all six years and can be tracked over the years. The data is available in SAS format.

The data set is the same that is used in the investigation of church disaffiliations in Chapter 4. For more information on the data set see Section 4.5.1.

Below I describe the definition of the variables used in the empirical part of this chapter. In order to answer my research questions, I estimate equations similar to the one in equation (5.1) with voluntary giving on the left hand side and income, price of giving and socio-demographic variables as explanatory variables. I extend this equation by adding a variable measuring church membership resp. church disaffiliation.

5.4.1 Donations

Since this study is based on tax data, definitions of donations are based on the income tax law. Donations are tax-deductible as special expenses, i.e. they reduce the taxable income of the taxpayer. § 10b of the German income tax law distinguishes between five types of donations. The first type comprises donations to "benevolent, parochial, religious, scientific or especially eligible charitable purposes" (translation taken from Borgloh, 2008: 7). These donations are tax deductible up to an amount of 5 % of overall income. Second, for donations to "benevolent, scientific and especially eligible cultural purposes" (ibid.) the income tax law provides the possibility to deduct an additional 5 % of overall income.[105] Third, an additional amount up to 20,450 euro can be deducted for donations to foundations. Fourth, there is an additional maximum deduction for the creation of charitable foundations. Fifth, donations to political parties and voters' associations are tax-deductible under certain conditions.

In what follows, I disregard donations for the creation of a charitable foundation, because these are rare and on average much higher than donations in the other categories and it is

[105] In 2007 a new tax treatment of voluntary giving has been established in Germany. The two categories of donations are no longer treated separately; all giving is deductible up to 20 % of overall income.

expected that the decision process leading to the creation of a charitable foundation differs from that of making a charitable contribution to some existing organization. I also abstain from including donations to political parties and voters' associations since I do not consider them to be charitable and therefore do not expect the hypotheses derived from my theoretical model to apply. Disregarding donations for the creation of a charitable foundation and donations to political parties and voters' associations corresponds to the approach chosen in previous papers on voluntary giving in Germany (e.g. von Auer und Kalusche, 2007).

The remaining three categories of giving are analyzed jointly (and will henceforth be called "total donations"), the first and second category are also analyzed separately. It should be noted that, although I use the terms "donations" or "charitable giving", both the donations to "benevolent, parochial, religious, scientific or especially eligible charitable purposes" and the donations to "benevolent, scientific and especially eligible cultural purposes" also include membership fees. It is not possible to distinguish between charitable contributions and membership fees in the data set. However, membership fees to associations which mainly provide leisure activities for their members[106] cannot be deducted as special expenses and are therefore not included in the data.

In addition to "total donations" I also look donations to "benevolent, parochial, religious, scientific or especially eligible charitable purposes" and donations to "benevolent, scientific and especially eligible cultural purposes" separately. There are two main reasons for this approach. The first reason is that in the model in Chapter 3, from which I derive my hypotheses, I distinguish between religious and non-religious giving. Unfortunately, the data does not allow separating religious from secular giving, since the donations that are tax deductible up to 5 % of overall income include contributions to religious as well as secular purposes. However, the second category of donations, which are tax deductible up to 10 % of overall income, does not include any religious giving. To be more precise, the first category includes donations and membership fees to a wide range of benevolent purposes, such as education, public health, welfare organizations, tolerance and democracy, development aid, animal protection, sports and many more.[107] In addition, the first category of giving also includes giving to religious communities, e.g. for training and maintenance of the clergy, construction and maintenance of buildings, religious education and holding services. In

[106] According to Appendix 1, section B EStDV (*"Einkommensteuer-Durchführungsverordnung"* – "Ordinance Regulating the Income Tax Law"), membership fees to associations which promote sports, cultural activities for recreational purposes, preservation of local heritage and some other hobbies such as allotment gardening and breeding of small livestock, are not tax deductible.
[107] For a full list of especially eligible charitable purposes see Appendix 1 EStDV.

contrast, the second category of donations, i.e. donations to "benevolent, scientific and especially eligible cultural purposes", comprises the selfless support of individuals with physical or mental impairment and/or in a difficult economic situation ("benevolent purposes"), support for research and training in the sciences ("scientific purposes") and giving for the support of art, maintenance of objects of artistic or cultural value and the preservation of cultural heritage ("cultural purposes"). The differences in the nature of theses two types of giving will be accounted for in the interpretation of the results. When I look at the effects of church membership or church disaffiliation on donations which are deductible up to 10 % of overall income, I compare them to the hypotheses derived for secular giving. The results for donations which are deductible up to 5 % of overall income are evaluated against the hypotheses for both religious and non-religious giving.

The second reason for separating the two categories of giving is that donations which are deductible up to 5 % of overall income also include local church taxes. Local church taxes are a special form of collection of church taxes that are meant to benefit the local parish. They exist only in some parts of Germany and are sometimes voluntary and other times obligatory (i.e. taxes in a legal sense) (Petersen, 2010: 73). Their quantitative importance differs between regions. There is some debate as to whether local church taxes are perceived as voluntary or obligatory contributions, since payment is usually not enforced even when they are obligatory (Petersen, 2010: 73). As far as church members see these local church taxes as an obligatory contribution to their church, the declaration of them as charitable contributions in their tax returns, may result in an overestimation of their true *voluntary* giving. When these individuals leave the church and they do not feel obliged to pay local church taxes any more, their declared amount of donation might decrease although their true *voluntary* giving has not changed or has even increased. Therefore the second category of giving, which includes only secular donations, is examined separately, since a bias caused by local church taxes is not expected to occur in this case.

The two categories of giving described above are measured using variable c65454 *("Spenden bis 5 % GdE abzugsfähig")* for donations which are tax deductible up to an amount of 5 % of overall income, and variable c65455 *("Spenden bis 10 % abzugsfähig")* for donations which are tax deductible up to an amount of 10 % of overall income. In order to arrive at the amount of "total donations" I also add the additional amount given to charitable foundations (*"zusätzl. Höchstbetrag Spenden an Stiftungen"*, variable c65452) and – for businesses – donations up

to 0.2 % of the sum of total revenues and wages (*"Spenden bis 2 vT GdE abzugsfähig"*, variable c65456).[108]

The amounts are deflated with the consumer price index for Germany with the base year 2005. Data on the consumer price index is taken from the Federal Statistical Office (Statistisches Bundesamt, 2010: 522). Afterwards, one euro is added to the sum of donations of each taxpayer before I take the logarithm. Logarithmic values are chosen because the distribution of voluntary giving is skewed with a lot of observations of low levels of giving and a long tail on the upper end of the distribution. Taking the logarithm ensures that the distribution is closer to a normal Gaussian distribution. One euro is added for each taxpayer because the logarithm of zero is not defined.[109] I also choose the value of one euro because after taking the logarithm the result is zero, which provides a natural lower bound for giving.

Besides the amount given I also investigate whether someone makes a charitable contribution at all, i.e. the extensive margin of the giving decision. I define dummy variables indicating whether someone is a donor for the categories of total giving, giving to "benevolent, parochial, religious, scientific or especially eligible charitable purposes" and giving to "benevolent, scientific and especially eligible cultural purposes" separately. The individual is defined to be a donor if the variables in the tax return data pertaining to the respective category of giving indicate any positive amount of contribution.

5.4.2 Income

Unfortunately tax return data for estimating price and income elasticities of voluntary giving includes only tax-related definitions of the income variable. These are sum of income *("Summe der Einkünfte")*, overall income *("Gesamtbetrag der Einkünfte")*, income *("Einkommen")* and taxable income *("zu versteuerndes Einkommen")*. It would be preferable to have an income definition which reflects "the actual spending power of a tax unit" (Bönke, Massarrat-Mashhadi and Sielaff, 2013: 46). This is not entirely the case for tax definitions of income because they include various tax exemptions and tax reliefs. For example, a large share of pensions as well as capital income below a certain threshold are tax-exempt and therefore not reported. Unemployment benefits, sickness benefits, payment during parental leave and similar benefits are not included, as well as social security contributions and child benefits. In addition, changes in the value of property are usually missing.

[108] The total amount of giving reported in the last two variables is negligible.
[109] There is some debate in the literature which amount should be added. This discussion is relevant because the amount added has an influence on the results.

There have been various attempts to adjust tax-related income definitions in order to reflect the "actual spending power" of an individual, e.g. Merz, Hirschel and Zwick (2005), Bönke, Neher and Schröder (2007), von Auer and Kalusche (2007), Bach, Corneo and Steiner (2009). For studies on voluntary giving in Germany both adjusted income (e.g. von Auer and Kalusche, 2007; Bönke, Massarrat-Mashhadi and Sielaff, 2013) and unadjusted tax definitions (e.g. Paqué, 1986; Borgloh, 2008) have been used.

Von Auer and Kalusche (2007: 50-51) propose to use the overall income and taxable income as the upper and lower bounds of income and estimate equations with both of these definitions. Another possibility is to argue that the income definition chosen has a negligible effect on estimated elasticities and therefore one of the measures, preferably the overall income, can be chosen (Borgloh, 2008: 11).

The approach chosen in this chapter is to calculate an adjusted overall income (which I will also call economic income) that resembles the "actual spending power" of the individual as closely as possible, thereby following the approaches of von Auer and Kalusche (2007) and Bönke, Massarrat-Mashhadi and Sielaff (2013). The overall income is taken as a starting point.

In the following I outline the calculation of the economic income used in this chapter only briefly since the definition of economic income is substantially the same as in Chapter 4. There are two main differences: first, this chapter also looks at individuals who choose the joint marital assessment, while Chapter 4 does not. As a consequence, whenever a relevant variable is separately reported for each spouse, I add up the two values. Second, in order to avoid endogeneity problems I calculate the income for each taxpayer as if he or she had not made donations. This is similar to Section C.3.2 where I calculate the income as if the individual had not paid church taxes. The approaches in the two chapters resemble each other since both donations and church taxes paid are treated as special expenses.

In the first step, the income tax liability of the tax payer is subtracted from overall income. The tax liability depends on the amount of charitable contributions an individual makes; therefore adjusted income also depends on the amount of contributions. In order to avoid endogeneity, the tax liability of each taxpayer is calculated under the assumption that no donations are made. The income tax is calculated applying the tax function of § 32a ITL to the taxable income plus donations. The sum is not rounded. The type of assessment (single assessment or joint marital assessment), income under the "exemption with progression" rule

(*"Einkommen unter Progressionsvorbehalt"*, § 32b ITL) and extraordinary income (*"Außerordentliche Einkünfte"*, § 34 ITL)[110] are taken into account. However, special tax rates for taxpayers who have extraordinary income according to § 34b ITL (extraordinary income from forestry) have not been taken into account. Similarly, for taxpayers who have extraordinary income according to both § 34(1) ITL and § 34(2) ITL, only the special tax rate for the latter type of extraordinary income has been calculated, while the former type of income is treated as if it was regular income. Those simplifications are made because only a small number of taxpayers are affected and substantial changes of the empirical results are not to be expected.

In the second step, the solidarity surcharge is subtracted. The solidarity surcharge amounts to 5.5 % of the income tax liability (or less than 5.5 % when the income tax liability is below a certain threshold income). Since the solidarity surcharge that was actually paid depends again on the donations made, the solidarity surcharge is also re-calculated under the assumption that no donations are declared. The income tax liability as the calculation base for the solidarity surcharge is mostly calculated as described in the previous paragraph, but child allowances are subtracted when assessing the taxable income. Income under the "exemption with progression" rule is taken into account, however, the income tax rate on income under the "exemption with progression" rule is not adjusted for the changes in the computation of taxable income (in particular, the inclusion of child allowances). Simplifications regarding extraordinary income are made as described above. In addition, taxes on extraordinary income are adopted from the calculation of income taxes (instead of re-calculating them for the income less child allowance) when the taxpayer reports both extraordinary income and income under the exemption with progression" rule. Furthermore, tax reductions are subtracted from the income tax thus calculated. Tax reductions are defined as the difference between collective income tax *("tarifliche Einkommensteuer")* and income tax due *("festzusetzende Einkommensteuer")* in the original data.

In the third step of calculating economic income, I add income under the "exemption with progression" rule.

[110] Accounting for extraordinary income may seem too complicated, given that only a small share of taxpayers declare this kind of income. However, these taxpayers are very interesting to look at since their price of giving is particularly low – in some cases, it can even be negative (see Jahnsdorf and Lorschneider, 2000; Hundsdoerfer, Kiesewetter and Sureth, 2008: 73). This is because they face progressive taxation of both their regular and their extraordinary income.

Fourth, reductions for income from farming (*"Freibetrag für Land- und Forstwirtschaft"*, § 13(3) ITL), reductions for aged persons (*"Altersentlastungsbetrag"*, § 24a ITL) and reductions for single parents (*"Entlastungsbetrag für Alleinerziehende"*, § 24b ITL) are added. These tax allowances are subtracted from the total income when calculating the overall income, but are now added again.

Fifth, extraordinary financial burdens (*"Außergewöhnliche Belastungen"*, § 33 ITL), alimony payments to a separated or divorced partner (*"Unterhaltsleistungen"*, § 10(1)(1) ITL), extraordinary financial burdens for child support (*"Unterhaltsaufwendungen"*, § 33(1) ITL) and expenses for own children's education (*"Ausbildungskosten"*, § 33(2) ITL) are subtracted.

Sixth, child benefits are added to overall income. The amount of child benefits a taxpayer receives is not included in the data set. Instead, it is estimated from the amount of child allowance. Note that taxpayers who are assessed individually usually receive 50 % of the tax allowance for each of their children. The calculation is the same as in Section C.3.3 in the appendix.

Seventh, the tax-exempt part of pensions is added to the income. Before 2005, the share of pension payments that was taxed depended on the age of the taxpayer when he or she first received the pension. The full amount of pensions is calculated taking into account the taxable share as reported in the data set. Starting in 2005, 50 % of pension payments were taxable. Therefore, the total amount of pensions is calculated by doubling the taxable pension payments reported in the tax returns.

Eighth, capital income below the savings allowance is added whenever it is reported in the tax return. Unfortunately, this income need not be reported and is presumably missing in many cases.

Ninth, tax-exempt income and deductions that refer to a specific type of income are added. They comprise tax-exempt capital gains *("steuerfrei bleibende Veräußerungsgewinne")*, the deduction for income from agriculture and forestry *("Freibetrag nach § 14a Abs. 4 EStG")*, deductions for pensions of civil servants *("Freibeträge für Versorgungsbezüge")* and deductions for other income (*"Versorgungsfreibetrag bei Einn. i.S.d. § 52 Abs. 34c S. 1 EStG"* and *"Versorgungsfreibetrag zu Abgeordnetenbezügen"*).

Tenth, the received amount of the pensions-savings grant *("Altersvorsorgezulage")* and the employee's savings premium *("Arbeitnehmersparzulage")* are added.

Eleventh, an important type of tax-exempt income, the so-called "half-income" *("Halbeinkommen")* is added.

Twelfth, the difference between the collective income tax *("tarifliche Einkommensteuer")* and the final income tax *("festzusetzende Einkommensteuer")* is added to the overall income. That amount consists of tax reductions (§ 34c – 35a ITL), i.e. they reduce the amount of income tax the individual actually needs to pay.

Finally, I deflate the amount of income with the consumer price index for Germany provided by the Federal Statistical Office (see Statistisches Bundesamt, 2010: 522). If the amount of income calculated in the steps I have outlined in this section is below one euro, I set it to one euro. Finally, I take the natural logarithm. In all estimations, I use the logarithm of economic income instead of economic income itself.

5.4.3 Price of giving

Donations are treated as special expenses in the German income tax law and as such reduce the taxable income and thus the tax liability of the giver. Higher taxable income leads to higher marginal tax rates, therefore earners of high incomes can save more money by using tax deductions for voluntary giving. The relevant price in this respect is the marginal price, i.e. how much one can save (in taxes) by giving an additional euro. Since this measure is endogenous with respect to the amount given, it is common practice in the literature to calculate the tax price of giving as one minus the marginal tax rate for the first euro of giving (Bönke, Massarrat-Mashhadi and Sielaff, 2013: 44-45). In this research I calculate the marginal tax rate in the following way: first, income tax liability and solidarity surcharge are calculated as described earlier, i.e. under the assumption that the taxpayer does not declare any donations while taking into account the basic and joint marital tax scheme, extraordinary income and income under the "exemption from progression" rule. Second, income tax liability and the solidarity surcharge are re-calculated under the assumption that a donation of one euro is declared – in other words, that the taxable income is reduced by one euro. The difference between those two tax liabilities is then subtracted from one in order to calculate the price of giving.[111] For non-itemizers (for a definition, see Section 5.4.4 below), I simply set the price of giving to one. These taxpayers use their blanket allowance for special

[111] Of course, this approach to the calculation does not provide the correct results for borderline itemizers. However, this group is excluded from the estimations.

expenses, therefore a marginal increase (e.g. by one euro) in their donations would not change their income tax liability.

5.4.4 Itemization status

Identifying the itemization status of the taxpayer is important when estimating the determinants of voluntary giving since it affects the price of giving of the individual. The price of giving is usually less than one when the taxpayer deducts the donation as a special expense and taxable income is reduced by the amount of the donation. However, each taxpayer has a blanket allowance for special expenses, which means that he or she can deduct a certain amount even if he or she does not declare any special expenses. The blanket allowance is 36 euro for individually assessed taxpayers and 72 euro for jointly assessed married couples. Take the example of a taxpayer who does not declare any special expenses besides donations. If that person makes a small donation (smaller than the blanket allowance), he or she will still use the blanket allowance and the donation does not reduce the taxable income. Therefore, the price of giving is one. Such a person is called a non-itemizer. If the same person made a donation that exceeds the blanket allowance, the donation would be deducted. However, without the donation the individual would have used the blanket allowance and would have also been able to deduct a certain amount. Consequently, the individual can only reduce the taxable income by the amount that the donation exceeds the blanket allowance. That means that the tax price of the first euro of the donation is one, but for any euro that the donation exceeds the blanket allowance the price is usually below one. Such a person is called a borderline itemizer.

In short, non-itemizers are those individuals who use the blanket allowance for special expenses, while borderline itemizers are those taxpayers who exceed the blanket allowance only because of their donations. The third group of taxpayers are those who have some other kind of special expenses except donations, such that they would not use the blanket allowance even if they did not make a donation. I shall call this group “regular itemizers”.

The literature on voluntary giving agrees that borderline itemizers need to be excluded from the sample. They are excluded in all German studies that I am aware of. They have a first euro tax price of one, which overestimates the price they face once they exceed the amount of the blanket allowance. Therefore the price of the first euro of giving cannot be taken as an instrument for the marginal price, which is actually the relevant price. The problem is even more severe since taxpayers only belong to the category of borderline itemizers because they make a contribution that is large enough to make itemization attractive. In sum, their fiscal

incentive to make a contribution is not captured correctly. The case for excluding borderline itemizers was first made by Clotfelter (1980: 325-328).

Including non-itemizers in the sample also raises some difficulties since these taxpayers have no incentive to report their voluntary giving. They might well make a (small) donation, but as long as the sum of their special expenses (including the donation) does not exceed the blanket allowance, reporting it will not reduce their taxable income.

In the results section I will present estimations both on the sample of regular itemizers only and on regular itemizers and non-itemizers jointly. How this approach helps to answer my research questions is discussed in detail in Section 5.4.8.

5.4.5 Socio-demographic variables

Socio-demographic variables include the type of assessment and gender, age, number of children and region of residence of the taxpayer.

The "type of assessment and gender" variable differentiates between single males, single females and married couples. The gender is identified with variable ef8 *("Geschlecht")*, which refers to the gender of the person who files the tax return. When married couples choose the joint marital assessment, the person filing the tax return is by definition the husband. Married couples are identified in the data set with variable ef18 *("Veranlagungsart")*. Only when variable ef18 is equal to 2 (which stands for "joint marital assessment"), the gender variable takes on the value for married couples. That means that individuals who are married, but individually assessed, fall into the "single male" and "single female" categories. Examination of the raw data has shown that there is a certain degree of misreporting of gender, since there is a small but not negligible number of changes in the gender reported for single individuals. Therefore I assign to each individual the gender reported for the year 2005 for each year when he or she was not assessed with a spouse. If the individual was assessed with his or her spouse in 2005, but not in 2006, I assign the gender of 2006. These two years are chosen because the gender reported in the later years included in the data set appears to be more reliable than that for earlier years. However, the approach bears the possibility that the incorrect gender is assigned to some individuals. Furthermore, if individuals were assessed as a married couple in 2005 and 2006, but as a single individual in earlier years, changes in the reported gender are not accounted for.

Age is measured with a dummy variable for each ten year age group (below 30; 30 to 39; 40 to 49; 50 to 59; 60 to 69; 70 and above – whereby the first and the last group do not have a

defined lower and upper limit, respectively). Age is calculated using the date of birth given in variables ef43 *("Geburtsdatum –A–")* and ef44 *("Geburtsdatum –B–")*. The last four digits of the date of birth are the year of birth. Age is calculated as the difference between the year that the data point refers to (2001, 2002, . . . 2006) and the year of birth. For taxpayers who chose the joint marital assessment the age of the husband constitutes the age of the taxpayer. If the year of birth is not in the range between 1891 and 2006, a missing value is assigned. The number of missing values for year of birth is then reduced by assigning to the individual the year of birth given in the tax return of the year closest to the year when the data is missing – provided the year of birth is not missing then and the reported gender is the same.

The region of residence is measured by dummy variables for East and West Germany. The information is taken from the variable bl *("Bundesland")* – the Land where the individual lives. West Germany comprises the West German area states as well as all city states including Berlin. East Germany comprises the five East German area states. The assignment of Berlin as a West German Land is debatable; however, I follow the classification given by the Federal Statistical Office. For individuals who have an average yearly overall income above 150,000 euro, the Land is not included in the data set, instead, one only knows whether the individual lives in East or West Germany, where Berlin is treated as part of West Germany. This anonymization of data is implemented for reasons of data security.

The number of children is covered by four dummy variables: no children, one child, two children, and three or more children. The information about the number of children is derived from variable c65748 *("Zahl der Kinder (ZK+ZHK)")*.

5.4.6 Church membership and disaffiliation

The church membership variable divides individuals into three general groups: church members, non-members and church members who disaffiliate from the church during the study period. In accordance with the definitions in Chapter 4 I define only Catholics and Protestants as church members. Non-members are those without religious affiliation as well as "others", i.e. members of the Old Catholic Church *("Altkatholische Kirche")*, some Religious Humanist communities *("Freireligiöse Gemeinden")* and some Jewish communities.

An examination of the data set showed that there are some inexplicable changes in church membership, e.g. where the church membership status changes more than once in the six years under investigation. In particular, high rates of disaffiliation and re-affiliation can be found in the city-state of Hamburg. A consultation with the responsible person in the Federal

Statistical Office showed that there were coding problems in Hamburg. In order to circumvent these problems, I create a very cautious measure of church disaffiliation. First, I measure changes in church membership from year to year. If the church membership status of the individual changes once between 2001 and 2006, I count that as an affiliation or disaffiliation. If membership status changes more than once, I do not recognize this as a church disaffiliation and instead assign the membership status of the year 2001 for all years. Such a definition of church disaffiliation is rather conservative because it only recognizes cases where there are no doubts about the change in membership. However, the possibility exists that some individuals who do disaffiliate are mistakenly counted as members. All individuals who actually disaffiliate and then re-affiliate are also put in the "member" category. Individuals who join the church (with the affiliation being the only change in membership) are counted as non-members as long as they are non-members and as members beginning in the year of affiliation.

Individuals who do not affiliate or disaffiliate are either classified as members or as non-members. For individually assessed taxpayers the membership status is defined as described in the previous paragraph. For married couples, the church membership status is assessed individually. A married couple is counted as a member if at least one spouse is a church member according to the above criteria. If individuals are married (and assessed according to the joint marital assessment) in some, but not all sample years, I only consider the church membership status of the individual for which I have information for all six years.

In the case that the taxpayer disaffiliates in any of the years between 2001 and 2005,[112] I determine the exact year when he or she leaves. If an observation belongs to a year that lies before the year of disaffiliation, the dummy variable "before disaffiliation" is assigned the value one. Similarly, I account for the "year of disaffiliation" and the years "after disaffiliation". If the taxpayer is a jointly assessed married couple in all panel years, the disaffiliation of either of the two partners is counted as a disaffiliation. If both partners disaffiliate at different points in time, only the first disaffiliation is taken into account. If the individual is married (and chooses joint marital assessment) in only some of the sample years, but unmarried or individually assessed in others, I only look at the church membership change of the individual for which I have data in all years.

[112] Disaffiliations in 2006 are not visible in the data.

5.4.7 Exclusion of observations

Some observations need to be excluded for various reasons. First, I exclude all observations that have missing data for any of the relevant variables. Second, I exclude borderline itemizers for the reasons discussed in Section 5.4.4. Third, individuals with a negative price of giving are also left out of the sample. The price of giving can be negative in some exceptional cases where the taxpayer has extraordinary income according to § 34(1) ITL. The highest marginal tax rates on extraordinary income are equal to five times the maximum marginal tax rate on "regular" income (currently 42 % or 45 %). In other words, an increase in income by one euro can lead to an increase in income tax by up to 2.10 euro (see Jahndorf and Lorscheider, 2000, for an extensive discussion). This means that the price of giving is -1.10 euro. Such extreme cases are rare, but they exist in the data set. Two problems arise when the price of giving is negative. The first problem is that the estimations include logged values of prices. However, taking the log of a negative number is not possible. The second problem is that preliminary estimations have shown that the estimated price elasticity is very sensitive to the inclusion and exclusion of extreme values of the price of giving. Still, I want to retain as many observations as possible. Therefore I decided to exclude all observations where the price of giving is negative. This also means that cases in which the price of giving is positive, but close to zero, are still included.

5.4.8 Limitations of the data

The research questions and hypotheses necessitate looking at the data from two different perspectives. The first perspective is a cross-sectional one. I want to compare the voluntary giving of church members and non-members. The second perspective is longitudinal, i.e. I want to compare the behavior of the same individual before and after church disaffiliation. Both approaches face some difficulties when applied to the data.

In the cross-sectional perspective, there would be no challenges if I could use information about all individuals and the data for all individuals had the same quality. I could for example use pooled estimation or any other estimation technique which does not eliminate between-person variation. Unfortunately, data on charitable contributions is not available for church members and non-members in the same quality. The reason is the regulation concerning itemization for special expenses. Taxpayers can itemize their special expenses, i.e. they can deduct special expenses from their taxable income, which in turn reduces their income tax liability. Non-itemizers, i.e. individuals whose charitable contributions are below the blanket allowance for special expenses and who do not have any other special expenses, have no

incentive to report their charitable contributions.[113] There will be an under-reporting of small charitable contributions in this group. When individuals make donations that exceed the blanket allowance, they fall into the category of borderline itemizers. They have an incentive to report their donation, but only because the donation is large. If it were smaller, they would probably not report it.

In contrast, regular itemizers have special expenses that exceed the blanket allowance, even if they do not make any charitable contributions. Their price of giving is equal to one minus the marginal tax rate, which is usually below one. For those individuals it makes sense to report each euro of charitable contributions, since it further reduces their taxable income.

To sum up, one can expect regular itemizers and borderline itemizers to report all charitable contributions, while there is probably an underreporting of contributions of non-itemizers. This fact would be a minor problem for my research if church members and non-members were equally likely to be in any of the three itemizer categories. However, this is not the case. The reason is that church taxes are special expenses, just like charitable contributions. Since the church tax liability usually exceeds the blanket allowance, almost all church members are regular itemizers, while the share of regular itemizers among non-members is much lower. Those non-members who do itemize usually have a higher income than non-itemizers.

This means that for church members data on voluntary giving should be almost complete, while for non-members small contributions are likely to be missing. As a result, in the data set the share of givers among non-members might be underestimated, while the amount given conditional on making a contribution might be overestimated. This is because some non-members who make a small contribution are counted as non-givers because of their missing data.

There are two ways to approach the data. The first option is to use the data for regular itemizers and non-itemizers and accept that the quality of the data on giving likely differs. In German research on voluntary giving, data on both itemizers and non-itemizers is used by Bönke, Massarrat-Mashhadi and Sielaff (2013). I can also follow the reasoning of von Auer and Kalusche (2007) and exclude all non-itemizers. Then only a few non-members remain in the data set, which might not be a representative sample of the population of non-members, e.g. with respect to their income. Income is controlled for in the regression; however, one

[113] The same situation arises when the individual has some kind of special expense (other than donations) which is below the blanket allowance and makes a charitable contribution which is low enough such that the sum of donations and other special expenses does not exceed the blanket allowance.

cannot fully exclude the possibility that the probability of giving of non-members and the amount given are over-estimated when only regular itemizers are included. Therefore I present results for both a sample where non-itemizers are included and a sample of regular itemizers only and discuss the issues that I brought up in this paragraph when interpreting the results.

Itemization also causes some problems in answering the second research question as to how voluntary giving changes during the process of disaffiliation. Such research should rely on within-individual variation in giving; ideally, one would use fixed effects. Although I will apply some fixed effects estimation, I also use a different approach that applies cross-sectional and longitudinal aspects. I pool the data, but look at when individuals disaffiliate from the church and then assign dummies for the years before, during and after disaffiliation. This way I can assure that an individual who disaffiliates is in all three categories in the pooled estimation. Excluding taxpayers based on their itemization status can potentially undermine the effort to have the same individuals in the "before disaffiliation" and "after disaffiliation" group. The reason is that individuals are usually regular itemizers before they leave the church, but become borderline itemizers or non-itemizers when they do not have to pay church taxes any longer. As before, I have to exclude borderline itemizers from the sample. If I use the sample consisting of regular itemizers and non-itemizers, then I probably underestimate giving after church disaffiliation. The reason is that I systematically exclude those individuals who are in the borderline itemizer category because they make a considerable contribution and only keep those individuals in the sample that are non-itemizers because they decide to make no or only a small contribution. However, if I should nevertheless find that giving increases after disaffiliation, then this can be seen as convincing evidence.

A second possibility is to reduce the sample to regular itemizers only. Here the problem is that before disaffiliation almost all individuals are in the sample, but after disaffiliation only those are left that remain itemizers, which is only a small (and probably not representative) share. Thus, I cannot compare the same individuals before and after disaffiliation. Therefore I decided to create a balanced sample of itemizers, i.e. I only look at those individuals who itemize in all six years (from 2001 to 2006) and compare giving before and after disaffiliation of people in this group who drop out of church. The advantage is that I do in fact compare the same individuals over time. On the downside I only look at a small sample of individuals with a high income and the results for this sample cannot easily be transferred to all taxpayers.

5.4.9 Summary Statistics

Table 5.1 shows the summary statistics. I use three different subsamples: individuals who are either regular itemizers or non-itemizers, i.e. only borderline itemizers are excluded; individuals who are regular itemizers; and individuals who are regular itemizers in all sample years.

Table 5.1: Summary statistics

	Itemizers and non-itemizers		**Regular itemizers**		**Itemizers in all sample years**	
Variable	**Mean**	**std. dev.**	**mean**	**std. dev.**	**mean**	**std. dev.**
Total donations						
Share of donors	0.310	0.463	0.482	0.500	0.525	0.499
Donation	115.54	19892.42	190.83	24533.53	224.50	27738.35
Donations to religious and charitable purposes (deductible up to 5 % of overall income)						
Share of donors	0.250	0.433	0.391	0.488	0.430	0.495
Donation	80.09	6575.89	132.26	8104.02	155.76	10390.73
Donations to benevolent, scientific and cultural purposes (deductible up to 10 % of overall income)						
Share of donors	0.091	0.287	0.141	0.348	0.155	0.361
Donation	31.65	16915.88	52.27	20866.65	61.94	22218.8
Price	0.820	0.768	0.700	0.480	0.668	0.360
Price (log)	-0.222	0.977	-0.368	0.669	-0.410	0.535
Income	38,217.00	932,997.1	44,789.65	1,142,632.8	49,155.96	1,311,474.7
Income (log)	10.207	5.796	10.455	4.024	10.601	2.933
Type of assessment and gender						
Single male	0.240	0.427	0.225	0.417	0.224	0.417
Single female	0.183	0.387	0.184	0.388	0.184	0.387
Married couple	0.577	0.494	0.591	0.492	0.592	0.491

Number of children						
None	0.572	0.495	0.575	0.494	0.576	0.494
One	0.195	0.396	0.189	0.391	0.188	0.391
Two	0.177	0.382	0.182	0.385	0.184	0.387
Three or more	0.056	0.230	0.055	0.228	0.052	0.221
Age						
70 and above	0.056	0.229	0.064	0.246	0.060	0.238
60-69	0.112	0.315	0.111	0.314	0.090	0.286
50-59	0.212	0.408	0.223	0.416	0.242	0.428
40-49	0.277	0.448	0.281	0.449	0.305	0.460
30-39	0.230	0.421	0.221	0.415	0.222	0.415
Below 30	0.114	0.318	0.100	0.300	0.081	0.273
Region						
East Germany	0.152	0.359	0.070	0.255	0.037	0.189
West Germany	0.848	0.359	0.930	0.255	0.963	0.189
Membership						
Church member	0.664	0.472	0.861	0.346	0.969	0.173
Non-member	0.292	0.455	0.099	0.299	0.018	0.131
Before disaffiliation	0.015	0.121	0.019	0.136	0.006	0.074
Year of disaffiliation	0.008	0.087	0.009	0.096	0.002	0.047
After disaffiliation	0.021	0.144	0.011	0.106	0.006	0.075
Year						
2001	0.169	0.374	0.167	0.373	0.167	0.373
2002	0.166	0.372	0.175	0.380	0.167	0.373
2003	0.167	0.373	0.175	0.380	0.167	0.373
2004	0.165	0.371	0.171	0.376	0.167	0.373
2005	0.174	0.379	0.169	0.375	0.167	0.373
2006	0.159	0.366	0.144	0.351	0.167	0.373
Sample size	5,014,594		3,295,334		1,879,806	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.

Not surprisingly, the sample size is largest in the sample consisting of both itemizers and non-itemizers and smallest in the sample of individuals who are itemizers in all years. The share of taxpayers who make a contribution and the average amount of the donation are highest in the smallest sample. In the sample consisting of regular itemizers and non-itemizers 31 % of the

taxpayers make a contribution and the average contribution is 115 euro.[114] In contrast, in the sample restricted to regular itemizers in all years, 53 % donate and the average contribution is 224 euro. In all three samples donations to "benevolent, parochial, religious, scientific or especially eligible charitable purposes" are more frequent and are on average higher than donations to "benevolent, scientific and especially eligible cultural purposes".

Some differences in the compositions of the samples are evident. Probably the most important difference is the share of non-members of the church. While it is close to 30 % in the sample comprising regular itemizers and non-itemizers, it is only 1.8 % in the sample of individuals who are regular itemizers in all years. This reflects the fact that church taxes are the most important type of special expenses and those who do not pay church taxes often fall in the category of non-itemizers (when, as is the case here, donations are also not counted as special expenses to avoid endogeneity problems). The small share of non-members among the regular itemizers in all years suggests that one should be careful in comparing church members and non-members in this sample because non-members might not be representative of the population of individuals who do not belong to the church. For example, one could speculate that those non-members who remain in the sample have a higher income since the sample average income is roughly 38,000 euro in the large sample (consisting of itemizers and non-itemizers) but 49,000 euro in the restricted sample.

Since church membership is low in East Germany, the share of non-itemizers is significantly higher there. Consequently, East German taxpayers make up 15 % of taxpayers in the large sample, but less than 4 % in the small sample consisting only of regular itemizers in all years. Less significant declines can also be seen in the share of males and the share of taxpayers below the age of 30.

Another point to note is that I observe roughly the same number of taxpayers in each sample year except 2006. By definition, in the sample of taxpayers who are regular itemizers in all sample years I have the same number of observations for each sample year.

[114] Again, I want to point out that the giving in this sample might also be so low because non-itemizers do not have an incentive to report (small) contributions that do not exceed the blanket allowance for special expenses.

5.5 Estimation methods

Data on voluntary giving, and the data available in the Taxpayer Panel in particular, provide some methodological challenges for the researcher. First, the dependent variable in an estimation of voluntary giving is left-censored, i.e. there is usually a large share of observations with zero giving because giving cannot be negative. Such a distribution makes the applicability of least squares methods questionable. Second, the data is panel data, which requires the application of panel data methods and the utilization of within-individual variation, i.e. changes in behavior of individuals over time. It would be desirable to look at changes in giving caused by church disaffiliation controlling for all constant characteristics of the individual. Third, the data set is stratified, which requires accounting for the sample selection method.

5.5.1 The Tobit model

Since least squares estimation is problematic in samples with a large share of zero values for the dependent variable, researchers began to apply an estimation strategy that was specifically developed for censored data: the Tobit model. It corrects the estimates for the bias introduced by the censoring. Tobit models are used in many studies on voluntary giving (see, e.g., Choe and Jeong, 1993; Auten and Joulfaian, 1996; von Auer and Kalusche, 2007).

When using a Tobit regression model, interpreting the results is not straightforward. In order to understand the results, one has to know how the regression method works.

The basic model is the following:

$$\begin{aligned} g^* &= \boldsymbol{x'\alpha} + \varepsilon \\ \varepsilon|\boldsymbol{x} &\sim \text{Normal}(0, \sigma^2) \\ g &= \max(0, g^*) \end{aligned} \tag{5.2}$$

The model assumes that there is an underlying variable g^* that has normally distributed errors, is not censored and is linearly related to the regressors $\boldsymbol{x}$. Applied to my data set, this would mean that g^* is the desired level of giving, which can also take on negative values. Of course, in reality the minimum giving level is zero. What one actually observes is the variable g which is the maximum of the minimum giving level of zero and some positive value g^*. In other words, there is a distribution with a positive probability mass on a discrete value, in the present case zero. Such a case is called "corner solution outcome" (Wooldridge, 2002: 518-519; Greene, 2008: 869-871).

I decided to use log giving, because giving is heavily skewed and taking the log makes the assumption of normally distributed error terms more plausible. Since the log of 0 is not defined, one euro is added to the amount given by each taxpayer, such that the dependent variable is zero when giving is zero. The model I estimate is therefore

$$\begin{aligned} \ln(g)^* &= \boldsymbol{x'\alpha} + \varepsilon \\ \varepsilon|\boldsymbol{x} &\sim \text{Normal}(0, \sigma^2) \\ \ln(g) &= \max(0, \ln(g)^*) \end{aligned} \tag{5.3}$$

where – in contrast to (5.2) – g now denotes the amount given plus one euro.

The density function is

$$\begin{aligned} &f(\ln(g)|\boldsymbol{x}) \\ &= \left\{1 - \boldsymbol{\Phi}\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)\right\}^{\mathbf{1}(\ln(g)=0)} \times \left\{\frac{1}{\sqrt{2\pi\sigma^2}} \times \exp\left(-\frac{(\ln(g) - \boldsymbol{x'\alpha})^2}{2\sigma^2}\right)\right\}^{\mathbf{1}(\ln(g)>0)} \end{aligned} \tag{5.4}$$

where $\boldsymbol{\Phi}(.)$ is the distribution function of the standard normal distribution and $\mathbf{1}(.)$ is the indicator function which is one when the condition in brackets is fulfilled, zero otherwise (see Burke, 2009: 585). The first part of the equation for $\ln(g) = 0$ gives the probability that the dependent variable is zero (the person does not make a donation) in a probit model. The second part of the density function for $\ln(g) > 0$ is the density function of the normal distribution. From this formula it can be seen that the Tobit model incorporates the assumptions that (a) the decision whether to give or not is a binary decision that follows a probit distribution, (b) the amount given follows a normal distribution with mean $\boldsymbol{x'\alpha}$ and standard deviation σ and (c) both decisions are influenced by the same set of explanatory variables $\boldsymbol{x}$ and explanatory variables have the same impact on the decisions at the extensive and the intensive margin, expressed through $\boldsymbol{\alpha}$.

If interest lies in $\ln(g)^*$, the parameter vector $\boldsymbol{\alpha}$ can easily be interpreted, since $\mathrm{E}(\ln(g)^*|\boldsymbol{x}) = \boldsymbol{x'\alpha}$ (Wooldridge, 2002: 520). A marginal increase in some regressor x_j increases $\mathrm{E}(\ln(g)^*)$ by the quantity α_j. In the present case the continuous exogenous variables (income and price) are also logs. Since both the left-hand side and right-hand side of the equation are in logs, the $\boldsymbol{\alpha}$s can interpreted as elasticities.

However, the interpretation of the effect of a discrete regressor x_j is more difficult. α_j can be interpreted as the increase in log giving when some regressor x_j changes from zero to one:

$$\alpha_j = \mathrm{E}(\ln (g)^* | \boldsymbol{x}, x_j = 1) - \mathrm{E}(\ln (g)^* | \boldsymbol{x}, x_j = 0) \tag{5.5}$$

Unfortunately, for discrete regressors there is no such convenient interpretation of α_j as the notion of "elasticity" for continuous regressors. Nevertheless one can compare the sizes of the effects of two discrete variables x_k and x_l on g^*. Since the logarithm is a continuous function, one can state that if some α_k is larger than α_l, the effect of x_k on giving is larger than the effect of x_l.

Apart from the problems in interpreting the estimated vector of $\boldsymbol{\alpha}$ for discrete variables, it is not very helpful to look only at the estimates for $\ln (g)^*$. They describe a hypothetical distribution that would prevail if $\ln (g)^*$ was not forced to be equal to or greater than zero. In corner solution outcomes such as the present one, it is more instructive to look at the unconditional expected value $\mathrm{E}(\ln (g)|\boldsymbol{x})$, i.e. the expected values of "real" (log) giving, and the conditional expected value $\mathrm{E}(\ln (g)|\boldsymbol{x}, \ln (g) > 0)$, that is the expected values of "real" (log) giving for those who actually give a positive amount. (Wooldridge, 2002: 520)

Starting with conditional expected giving, i.e. the giving of those who decide to make a contribution, we have

$$\mathrm{E}(\ln(g) | \boldsymbol{x}, \ln(g) > 0) = \boldsymbol{x'\alpha} + \sigma \times \left[\frac{\varphi\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)}{\boldsymbol{\Phi}\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)} \right] \tag{5.6}$$

where $\varphi(.)$ is the probability density function of the standard normal distribution. The ratio $\varphi(c)/\boldsymbol{\Phi}(c)$ is called the inverse Mills ratio and abbreviated $\lambda(c)$. It is easy to see that the expected value of $\ln(g)$ does not grow linearly with $\boldsymbol{\alpha}$, because the estimated $\boldsymbol{\alpha}$s also appear in the inverse Mills ratio, which depends on $\boldsymbol{\alpha}$ in a non-linear way. (Wooldridge, 2002: 521-522)

The partial effects of a change in a continuous variable x_j can be calculated with the following formula:

$$\frac{\partial \mathrm{E}(\ln(g) | \boldsymbol{x}, \ln(g) > 0)}{\partial x_j} = \alpha_j \times \left\{ 1 - \lambda\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right) \times \left[\frac{\boldsymbol{x'\alpha}}{\sigma} + \lambda\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right) \right] \right\} \tag{5.7}$$

(Wooldridge, 2002: 522). It can easily be seen that the partial effect of a change in x_j depends both on all elements of the estimated coefficient vector $\boldsymbol{\alpha}$ and on the specific values that are

chosen for the vector $\boldsymbol{x}$. In accordance with previous literature and suggestions by Wooldridge (2002: 524) I use the vector of mean values $\overline{\boldsymbol{x}}$.[115]

Wooldridge (2002: 523) suggests calculating the effect of a change in a binary variable as the difference between the estimated values when the variable of interest has the values zero and one,

$$\begin{aligned} &\mathrm{E}\big(\ln(g)\,|\boldsymbol{x}, x_j = 1, \ln(g) > 0\big) - \mathrm{E}\big(\ln(g)\,|\boldsymbol{x}, x_j = 0, \ln(g) > 0\big) \\ &= \alpha_j + \sigma \times \lambda\left(\frac{\boldsymbol{x_{(1)}}'\boldsymbol{\alpha}}{\sigma}\right) - \sigma \times \lambda\left(\frac{\boldsymbol{x_{(0)}}'\boldsymbol{\alpha}}{\sigma}\right) \end{aligned} \tag{5.8}$$

where $\boldsymbol{x_{(0)}}$ is a vector of values for each variable x with the value of x_j set to zero (or to the reference value) and $\boldsymbol{x_{(1)}}$ is the same vector, but with the value for x_j set to one. In short, $\boldsymbol{x_{(0)}}'\boldsymbol{\alpha} = x_{\neq j}'\alpha_{\neq j}$ and $\boldsymbol{x_{(1)}}'\boldsymbol{\alpha} = \alpha_j + x_{\neq j}'\alpha_{\neq j}$.

Again, this figure grows with α_j, so one can say that for two discrete regressors x_k and x_l, $\alpha_k > \alpha_l$ implies that the effect of x_k on log giving by those who actually give is greater than the effect of x_l. Again, since the logarithm is a continuously increasing function, one can also infer that the effect on giving in levels (instead of logs) must be larger for x_k than for x_l.

The second interesting interpretation of $\boldsymbol{\alpha}$ is an estimate of the unconditional (log) giving, $\mathrm{E}(\ln(g)\,|\boldsymbol{x})$. This estimate is frequently reported in the relevant literature because the marginal effects of the $\boldsymbol{\alpha s}$ for price and income are the relevant price and income elasticities (Andreoni, 2006: 1235).

The measure is closely related to the measure I presented in the last paragraphs, since

$$\mathrm{E}(\ln(g)\,|\boldsymbol{x}) = \mathrm{P}(\ln(g) > 0|\boldsymbol{x}) \times \mathrm{E}(\ln(g)\,|\boldsymbol{x}, \ln(g) > 0) \tag{5.9}$$

where $\mathrm{P}(\ln(g) > 0|\boldsymbol{x})$ is the probability that log giving is greater than zero, given $\boldsymbol{x}$. $\mathrm{P}(\ln(g) > 0|\boldsymbol{x})$ can be calculated as $\boldsymbol{\Phi}(\boldsymbol{x}'\boldsymbol{\alpha}/\sigma)$ and is therefore strictly increasing in $\boldsymbol{\alpha}$.[116] At this point it is easy to see one critical restraint of the Tobit model that might not withstand reality: it is assumed that a change in some exogenous variable x_j has the same effect both on the probability to give and the amount given.

[115] For discrete variables, the sample share of each discrete value is taken instead of the mean.
[116] Again, for a binary regressor x_j I calculate the difference in the probability of giving when the variable takes on the values zero and one.

Plugging in the formulas for the two factors on the right hand side of equation (5.9) yields

$$\mathrm{E}(\ln(g)\,|\boldsymbol{x}) = \boldsymbol{\Phi}\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right) \times \boldsymbol{x'\alpha} + \sigma \times \varphi\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right) \tag{5.10}$$

The partial derivative for a continuous variable is simply

$$\frac{\partial \mathrm{E}(\ln(g)\,|\boldsymbol{x})}{\partial x_j} = \alpha_j \times \boldsymbol{\Phi}\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right) \tag{5.11}$$

i.e. the α_j times the probability that giving is greater than zero. (Wooldridge, 2002: 523-524). Again, the convention is to estimate the probability of positive giving at mean values of $\boldsymbol{x}$. For discrete variables, one can estimate $\mathrm{E}\big(\ln(g)\,\big|\boldsymbol{x}, x_j = 1\big) - \mathrm{E}\big(\ln(g)\,\big|\boldsymbol{x}, x_j = 0\big)$ by plugging in the estimate of the coefficient vector $\boldsymbol{\alpha}$, the mean values of $\boldsymbol{x}$ for all variables except x_j, as well as $x_j = 1$ and $x_j = 0$, respectively. Again, one can conclude that if $\alpha_k > \alpha_l$, it must be true that x_k has a greater effect on $\mathrm{E}(\ln(g)\,|\boldsymbol{x})$ than x_l has. This is because both factors on the right hand side of equation (5.10) grow in $\boldsymbol{\alpha}$.

As can be seen in equation (5.9) the Tobit model also allows calculating the probability that someone makes a donation, $\mathrm{P}(\ln(g) > 0|\boldsymbol{x})$. This probability can simply be expressed as

$$\mathrm{P}(\ln(g) > 0|\boldsymbol{x}) = \boldsymbol{\Phi}\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right) \tag{5.12}$$

The marginal effect on the probability of a change in an exogenous variable $\boldsymbol{x}$ is given as

$$\frac{\partial \mathrm{P}(\ln(g) > 0|\boldsymbol{x})}{\partial x_j} = \frac{\alpha_j}{\sigma} \times \varphi\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right) \tag{5.13}$$

(Wooldridge, 2002: 523). When the variable is discrete, the marginal effect is

$$\Delta\mathrm{P}(\ln(g) > 0|\boldsymbol{x}) = \boldsymbol{\Phi}\left(\frac{\boldsymbol{x_{(1)}}'\boldsymbol{\alpha}}{\sigma}\right) - \boldsymbol{\Phi}\left(\frac{\boldsymbol{x_{(0)}}'\boldsymbol{\alpha}}{\sigma}\right) \tag{5.14}$$

5.5.2 Two-part models

Estimating a model that relaxes the Tobit assumption that the two decisions whether to give at all and how much to give are generated by the same processes can provide more insights (Cameron and Trivedi, 2010: 553). Such models are called “two-part” (Cameron and Trivedi, 2010: 553), “two-tiered” or “hurdle models” (Wooldridge, 2002: 536). Different forms of the hurdle model have been proposed (Wooldridge, 2002: 536-538; Greene, 2008: 878-880).

Cameron and Trivedi (2010: 553-556) suggest a two-part model where the decision to give is estimated with a probit model and a separate linear regression is run for those individuals who have a positive response in the first part. An application of such a two-part model is Borgloh (2012). The advantage of the model is that the decision at the intensive margin (how much to give) can easily be estimated with panel models, especially fixed effects. Helms and Thornton (2012) also use this two-step procedure. They even estimate the decision at the extensive margin with fixed effects. However, this is only possible because they use a linear probability model, not a probit model.

Cragg (1971) proposes a different double hurdle model. As in the model discussed in the previous paragraph, the decision whether to give is estimated with a probit model, but the amount given is estimated with a truncated regression model. Applications of Cragg's hurdle model to voluntary giving are James and Sharpe (2007) and Showers et al. (2011). All two-tiered models share the advantage that they are more flexible than the Tobit model, but at the same time Cragg's model incorporates the Tobit model, i.e. if the decisions at the extensive and intensive margin are indeed influenced by the same regressors and with the same strength, the Tobit model emerges (Burke, 2009: 586).

I will call the exogenous variables that influence the decision whether to make a donation or not $\boldsymbol{z}$ and let $\boldsymbol{x}$ describe the regressors in the second-stage decision (how much to give). The density function in Cragg's model is

$$f(\ln(g)|\boldsymbol{x},\boldsymbol{z}) = \{1-\boldsymbol{\Phi}(\boldsymbol{z'\gamma})\}^{\mathbf{1}(\ln(g)=0)} \times \left\{\boldsymbol{\Phi}(\boldsymbol{z'\gamma}) \times \frac{\frac{1}{\sqrt{2\pi\sigma^2}} \times \exp\left(-\frac{(\ln(g)-\boldsymbol{x'\alpha})^2}{2\sigma^2}\right)}{\boldsymbol{\Phi}\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)}\right\}^{\mathbf{1}(\ln(g)>0)} \tag{5.15}$$

(Wooldridge, 2002: 538; Burke, 2009: 586). From comparing equation (5.15) with (5.4) it can easily be seen that Cragg's model is identical to the Tobit model for $\boldsymbol{x}=\boldsymbol{z}$ and $\boldsymbol{\gamma}=\frac{\boldsymbol{\alpha}}{\sigma}$. In addition, the density function can be split in two multiplicative parts. The first part is

$$f(\omega|\boldsymbol{z}) = \{1-\boldsymbol{\Phi}(\boldsymbol{z'\gamma})\}^{\mathbf{1}(\omega=0)} \times \{\boldsymbol{\Phi}(\boldsymbol{z'\gamma})\}^{\mathbf{1}(\omega=1)} \tag{5.16}$$

where $\omega = \begin{cases} 0, & \ln(g)=0 \\ 1, & \ln(g)>0 \end{cases}$. This is simply the density function of ω given $\boldsymbol{z}$ where ω follows a Bernoulli distribution. The probit model implies that the probability to observe $\omega=1$ can

be described by the distribution function of the normal distribution. The second multiplicative part in (5.15) is the fraction within the second set of brackets. This is the likelihood function of the truncated normal distribution for all $\ln(g) > 0$ with zero as the truncation point. It consists of the density function of the normal distribution with mean $\boldsymbol{x'\alpha}$ and standard deviation σ, divided by the probability that the dependent variable is larger than zero. The term in the denominator ensures that the density integrates to one (Greene, 2008: 864). Since there are two multiplicative terms, Cragg's model can be estimated in two steps. First, one estimates the probit model, and second, the truncated regression model. Both are estimated with the maximum likelihood method.

From Cragg's model one can also derive expected values and marginal effects of exogenous variables.[117] The structure is similar to the Tobit model.

First, one can calculate the probability that someone makes a positive contribution. This probability is now derived from the estimation of the probit model with the set of explanatory variables $\boldsymbol{z}$:

$$\mathrm{P}(\ln(g) > 0|\boldsymbol{z}) = \boldsymbol{\Phi}(\boldsymbol{z'\gamma}) \tag{5.17}$$

Consequently, the marginal effect of a change in variable z_j on the probability of giving is

$$\frac{\partial \mathrm{P}(\ln(g) > 0|\boldsymbol{z})}{\partial z_j} = \gamma_j \times \varphi(\boldsymbol{z'\gamma}) \tag{5.18}$$

When the variable z_j is a discrete variable, the marginal effect on the probability of giving can be calculated as the difference between the estimated probability when the variable is set to one and the probability when it is set to zero (or to the reference value), while all other variables remain at their average values,

$$\Delta\mathrm{P}(\ln(g) > 0|\boldsymbol{z}) = \boldsymbol{\Phi}\left(\boldsymbol{z_{(1)}}'\boldsymbol{\gamma}\right) - \boldsymbol{\Phi}\left(\boldsymbol{z_{(0)}}'\boldsymbol{\gamma}\right) \tag{5.19}$$

(Wooldridge, 2003: 533) where $\boldsymbol{z_{(0)}}$ is a vector of values for each variable z with the value of z_j set to zero (resp. to the reference value) and $\boldsymbol{z_{(1)}}$ is the same vector, but with the value for z_j set to one.

[117] The formulas that follow are taken from Burke (2009: 586-587).

The conditional expected value of (log) giving, i.e. the expected value conditional on $\ln(g) > 0$ is the same as in the Tobit model:

$$\mathrm{E}(\ln(g)\,|\boldsymbol{x}, \ln(g) > 0) = \boldsymbol{x'\alpha} + \sigma \times \left[\frac{\varphi\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)}{\boldsymbol{\Phi}\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)}\right] \tag{5.20}$$

The marginal effect of a change in x_j is also calculated in the same way as in the Tobit model (see equation (5.7)).

The unconditional expected value of $\ln(g)$ depends both on the results of the probit and the truncated regression:

$$\mathrm{E}(\ln(g)\,|\boldsymbol{x}, \boldsymbol{z}) = \boldsymbol{\Phi}(\boldsymbol{z'\gamma}) \times \left\{\boldsymbol{x'\alpha} + \sigma \times \left[\frac{\varphi\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)}{\boldsymbol{\Phi}\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)}\right]\right\} \tag{5.21}$$

The marginal effect of a variable x_j on unconditional (log) giving is

$$\begin{aligned} &\frac{\partial \mathrm{E}(\ln(g)\,|\boldsymbol{x}, \boldsymbol{z})}{\partial x_j} \\ &= \gamma_j \times \varphi(\boldsymbol{z'\gamma}) \times \left\{\boldsymbol{x'\alpha} + \sigma \times \lambda\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)\right\} \\ &+ \boldsymbol{\Phi}(\boldsymbol{z'\gamma}) \times \alpha_j \times \left[\mathbf{1} - \lambda\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right) \times \left\{\frac{\boldsymbol{x'\alpha}}{\sigma} + \lambda\left(\frac{\boldsymbol{x'\alpha}}{\sigma}\right)\right\}\right] \end{aligned} \tag{5.22}$$

if $x_j \in \{\boldsymbol{x}, \boldsymbol{z}\}$.[118] If x_j is only among the regressors explaining the amount given, but not whether to give at all, then γ_j is zero. If one is interested in the partial effect of a variable z_j, which is not part of $\boldsymbol{x}$, then equation (5.22) can be used under the condition that $\alpha_j = 0$. One simply substitutes x_j by z_j in the left-hand side of equation (5.22).

5.5.2.1 Panel data applications

The two-part model also lends itself to the application of panel data methods such as fixed effects estimation. As a robustness check for my main results, which are produced using a pooled panel, I will also present the results of a fixed effects least-squares estimation for the second part of the two-part model. That is, I restrict the sample to those individuals who make a positive charitable contribution and then regress the deviations from the means of the

[118] The second factor of the second summand is the marginal effect of a change in x_j on conditional (log) giving.

dependent variable on the deviations from the mean of independent variables. Standard errors are corrected for the resulting loss of degrees of freedom.

However, fixed effects estimation has some disadvantages. First, the effects of time-constant variables cannot be measured. This is because an independent variable that is constant over time for all individuals shows no deviations from the mean and no variance, therefore it cannot explain changes in the dependent variable. Consequently, I cannot distinguish between single males and single females, but only between single individuals and married couples. The results are then based on individuals who marry and couples who get divorced or choose separate assessment in some years. Similarly, results for East and West Germany are based on those individuals who move during the period under investigation. Most importantly, results for church membership are based on those individuals who disaffiliate from the church.[119] Results show the difference in giving before and after disaffiliation of the same individual.

Second, fixed effects estimation is also a within-estimation, i.e. only changes over time for the same individual are considered, not differences between individuals. This is in contrast to other estimation methods I apply where observations are pooled across individuals and time and the estimated coefficients reflect both differences between individuals and within individuals over time. For example, one would expect that the substantial difference in giving between church members and non-members is in part of cross-sectional nature, i.e. church membership is a proxy variable that also controls for other attributes of the individual such as upbringing or altruism. Instead, when applying within-estimation, all those constant, individual-specific variables (such as upbringing) cancel out and the "pure" effect of membership is measured.

5.5.3 Heckman's sample selection model

Another possibility to estimate the voluntary giving model is the Heckman sample selection model (for applications to voluntary giving, see Smith, Kehoe, and Cremer (1995), Bekkers and Schuyt (2008) and Borgloh (2008)). The Heckman model is somewhat similar to the double-hurdle models discussed above in that there are two steps which can be estimated separately: the decision to give at all and the amount given. Different regressors for estimating the participation decision on the one hand and the decision how much to give on the other hand can be used, whereas in the Tobit model the regressors and the estimated coefficients are assumed to be the same for both decisions (Heckman, 1979: 155). However, while in two-

[119] Individuals who affiliate during the study period are not considered in the estimation, since my main focus is on the change of giving caused by disaffiliation.

tiered models the underlying assumption is that those two decisions are separate processes and that the individuals who make a positive contribution are randomly selected from the population when all regressors are controlled for, the Heckman model acknowledges the possibility that the errors in both estimations can be correlated (Cameron and Trivedi, 2010: 556).

In more formal terms, the Heckman model assumes that there is a selection mechanism with a latent variable d^*,

$$d^* = \boldsymbol{z}'\boldsymbol{\gamma} + \varepsilon_1 \tag{5.23}$$

where ε_1 is a normally distributed error term. Instead of the latent variable d^* one can only observe a binary outcome d, in my case whether someone makes a contribution or not:

$$d = \begin{cases} 1, & d^* > 0 \\ 0, & d^* \leq 0 \end{cases} \tag{5.24}$$

As in Cragg's model, this part can be estimated with probit. From the results, one can estimate the Mills ratio $\lambda_i = \frac{\varphi(\boldsymbol{z_i}'\boldsymbol{\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z_i}'\boldsymbol{\gamma})}$ for each observation *i*. (Greene, 2008: 886) The second part of the Heckman model is a regression

$$\ln(g) = \boldsymbol{x}'\boldsymbol{\alpha} + \varepsilon_2 \tag{5.25}$$

for all observations where $d = 1$. What is different now in comparison to two-part models such as Cragg's model is that there are two processes modeled, one which determines whether one can observe the level of giving, and one which defines the amount given. In other words, in the Heckman model it is assumed that for the censored cases the dependent variable cannot be observed, whereas in the hurdle model the dependent variable is known to be at the censoring point (Lin and Schmidt, 1984: 175). However, the two processes represented in the Heckman model are not independent. The error terms ε_1 and ε_2 are assumed to have a *bivariate* normal distribution

$$\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \sim \text{Normal}\left[\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{bmatrix}\right] \tag{5.26}$$

where σ_{12} is the covariance of the errors. In order to acknowledge the correlation of the error terms, $\ln(g)$ is regressed on $\boldsymbol{x}$ and the inverse Mills ratio λ. (Greene, 2008: 886; Cameron

and Trivedi, 2010: 557) The Heckman model can be estimated by a two-step procedure or by maximum likelihood. I use PROC QLIM in SAS which does the latter.

In the Heckman model, it is advisable to use an exclusion restriction, i.e. to include one variable in the selection equation which is then excluded in the outcome equation. It is required that the variable has a substantial influence on the decision whether to make a donation, but no influence on the amount given. Since there is no variable available in the data set for which this requirement is fulfilled, I estimate the Heckman model without the exclusion restrictions. However, in this case identification of the parameter estimates in the outcome equation might be difficult. (Wooldridge, 2002: 564; Cameron and Trivedi, 2010: 558-561)

The first part of the Heckman model is a normal probit model, therefore the probability of giving can be calculated as in equation (5.17) and the marginal effect of a variable z_j on the probability of giving is given in (5.18) and (5.19). As in the Tobit and the two-part model, it is also possible to estimate conditional and unconditional expected values. The conditional expected value, i.e. the expected (log) giving conditional on making a contribution is

$$\mathrm{E}(\ln(g)\,|\boldsymbol{x},\boldsymbol{z},d^*>0)=\boldsymbol{x'\alpha}+\rho\times\sigma_2\times\frac{\varphi(\boldsymbol{z'\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z'\gamma})} \tag{5.27}$$

(Greene, 2008: 884-885). ρ is the error correlation in the two equations, therefore

$$\sigma_{12}=\rho\times\sigma_2 \tag{5.28}$$

Both σ_2 and ρ are given in the outputs produced by SAS. In order to find out if the two parts of the giving decision are indeed correlated, one can test the significance of the correlation coefficient ρ (Cameron and Trivedi, 2010: 561).

The marginal effect of a variable x_j on the conditional expected value is

$$\frac{\partial\mathrm{E}(\ln(g)\,|\boldsymbol{x},\boldsymbol{z},d^*>0)}{\partial x_j}=\alpha_j+\gamma_j\times\rho\times\sigma_2\times\frac{\varphi(\boldsymbol{z'\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z'\gamma})}\times\left(\frac{\varphi(\boldsymbol{z'\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z'\gamma})}+\boldsymbol{z'\gamma}\right) \tag{5.29}$$

(Greene, 2008: 885).

If x_j is a binary variable, the conditional marginal effect can be calculated as

$$\mathrm{E}(\Delta \ln(g) \,|\boldsymbol{x}, \boldsymbol{z}, d^* > 0) = \alpha_j + \rho \times \sigma_2 \times \left(\frac{\varphi(\boldsymbol{z}_{(1)}'\boldsymbol{\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z}_{(1)}'\boldsymbol{\gamma})} - \frac{\varphi(\boldsymbol{z}_{(0)}'\boldsymbol{\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z}_{(0)}'\boldsymbol{\gamma})} \right) \tag{5.30}$$

(Hoffmann and Kassouf, 2005: 1305) where $\boldsymbol{z}_{(0)}$ ($\boldsymbol{z}_{(1)}$) is a vector of values for each variable with the value of z_j set to zero (one). If z_j is a discrete variable with more than one category, $\boldsymbol{z}_{(0)}$ always characterizes the vector with the value of the reference category set to zero, while the values for each of the remaining categories is set to one separately.

The unconditional expected value is

$$\mathrm{E}(\ln(g) \,|\boldsymbol{x}, \boldsymbol{z}) = \boldsymbol{\Phi}(\boldsymbol{z}'\boldsymbol{\gamma}) \times \left(\boldsymbol{x}'\boldsymbol{\alpha} + \rho \times \sigma_2 \times \frac{\varphi(\boldsymbol{z}'\boldsymbol{\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z}'\boldsymbol{\gamma})} \right) \tag{5.31}$$

and the corresponding marginal effect is

$$\frac{\partial \mathrm{E}(\ln(g) \,|\boldsymbol{x}, \boldsymbol{z})}{\partial x_j} = \alpha_j \times \boldsymbol{\Phi}(\boldsymbol{z}'\boldsymbol{\gamma}) + \gamma_j \times \varphi(\boldsymbol{z}'\boldsymbol{\gamma}) \times (\boldsymbol{x}'\boldsymbol{\alpha} - \rho \times \sigma_2 \times \boldsymbol{z}'\boldsymbol{\gamma}) \tag{5.32}$$

(Hoffman and Kassouf, 2005: 1310-1311) when the variable is continuous and

$$\begin{aligned} &\mathrm{E}(\Delta \ln(g) \,|\boldsymbol{x}, \boldsymbol{z}) \\ &= \left[\boldsymbol{x}_{(1)}'\boldsymbol{\alpha} + \rho \times \sigma_2 \times \frac{\varphi(\boldsymbol{z}_{(1)}'\boldsymbol{\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z}_{(1)}'\boldsymbol{\gamma})} \right] \times \boldsymbol{\Phi}(\boldsymbol{z}_{(1)}'\boldsymbol{\gamma}) \\ &- \left[\boldsymbol{x}_{(0)}'\boldsymbol{\alpha} + \rho \times \sigma_2 \times \frac{\varphi(\boldsymbol{z}_{(0)}'\boldsymbol{\gamma})}{\boldsymbol{\Phi}(\boldsymbol{z}_{(0)}'\boldsymbol{\gamma})} \right] \times \boldsymbol{\Phi}(\boldsymbol{z}_{(0)}'\boldsymbol{\gamma}) \end{aligned} \tag{5.33}$$

(Hoffman and Kassouf, 2005: 1311) when the variable is discrete.

5.5.4 Pooling the sample

In my main estimations of the Tobit, the two-part and the Heckman model I pool the observations over all sample years. Pooled estimation gives correct estimates of parameters; however, I should have also used a robust variance estimator that accounts for serial dependence of the error terms. Serial dependence (or autocorrelation) emerges when the errors of the same individual are correlated over time. When non-robust standard errors are applied, one assumes that each new observation contributes the same amount of additional information as the last one. However, when autocorrelation is present, one can usually infer something about next year's giving of an individual when one knows about the individual's giving in previous years. Therefore adding the information for another year provides less and

less new information about the individual. The problem gets worse as the panel length (i.e. the number of observations for the same individual) or the degree of autocorrelation increases. (Petersen, 2009: 440-442)

I do not report autocorrelation-consistent standard errors for the Tobit, the Heckman and the second part of the two-tiered estimation. However, as a robustness test I report results for a single year where serial correlation is not an issue. I choose the year 2003, since this allows me to use the church membership variable that I have described above and to compare individuals who have left the church and those who are about to leave the church in one of the following years.

5.6 Results

5.6.1 The effect of church membership on giving

In this section the focus is on comparing the voluntary contributions of church members and non-members. As I have discussed in Section 5.4.8, church members and non-members face different incentives to report their charitable giving because of regulations concerning itemization of special expenses. Therefore I present results for the sample of regular itemizers where non-members might be under-represented, and for the sample of regular itemizers and non-itemizers where the amount given by non-members might by systematically under-reported.

Results are estimated with the Heckman method, Cragg's two-part model and the Tobit model. The reason for this variety of methods is that all estimation methods have certain methodological prerequisites that cannot be completely fulfilled. Therefore the application of different estimation methods is used as a robustness test.

5.6.1.1 Results of Heckman estimation

Table 5.2 shows the results of the Heckman estimation for the sample consisting of regular itemizers only. The advantage of the Heckman approach is that the decision to give at all (extensive margin) and the amount given (intensive margin) can be examined separately. The first column of Table 5.2 shows the results of the probit estimation of the binary decision whether to give at all, in the second column I report results on the outcome, i.e. the amount given, and in the remaining three columns I report the marginal effects on the probability to give and the conditional and unconditional amount given.

The highly significant parameter ρ signifies that the hypothesis of independence of the two parts of the Heckman estimation can be rejected (see Cameron and Trivedi, 2010: 559). The role of ρ can easily be seen in equation (5.28) where ρ determines the covariance of the errors in the two equations, σ_{12}. If $\rho = 0$, the covariance would also be zero and the two decisions would be unrelated. However, in my data the decision to give at all and how much to give are closely related. This implies that estimation methods such as the Heckman method which account for the correlation between the two decisions should be used.

Table 5.2: Estimation results and marginal effects of Heckman estimation for total donations of regular itemizers

	Estimation results				**Marginal effects**		
Variable	**Participation**		**Outcome**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-5.599	0.025 (0.000)	-6.025	0.037 (0.000)			
Price (log)	-0.246	0.008 (0.000)	-0.760	0.011 (0.000)	-0.098	-0.541	-0.718
Income (log)	0.493	0.002 (0.000)	0.881	0.003 (0.000)	0.196	0.443	1.135
Type of assessment and gender							
Single male	-0.048	0.002 (0.000)	0.057	0.004 (0.000)	-0.019	0.100	-0.044
Single female	0.117	0.003 (0.000)	0.217	0.004 (0.000)	0.047	0.115	0.278
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.291	0.003 (0.000)	-0.528	0.005 (0.000)	-0.116	-0.278	-0.704
One	-0.297	0.003 (0.000)	-0.599	0.005 (0.000)	-0.118	-0.345	-0.745
Two	-0.159	0.003 (0.000)	-0.382	0.005 (0.000)	-0.063	-0.249	-0.442
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.096	0.004 (0.000)	1.789	0.007 (0.000)	0.414	0.883	2.523
60-69	0.833	0.004 (0.000)	1.304	0.006 (0.000)	0.323	0.578	1.834
50-59	0.441	0.003 (0.000)	0.632	0.006 (0.000)	0.170	0.223	0.880
40-49	0.274	0.003 (0.000)	0.387	0.006 (0.000)	0.104	0.127	0.525
30-39	0.146	0.003 (0.000)	0.197	0.006 (0.000)	0.055	0.055	0.267
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

Region							
East Germany	-0.153	0.003 (0.000)	-0.232	0.005 (0.000)	-0.060	-0.094	-0.325
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Member	0.137	0.003 (0.000)	-0.054	0.004 (0.000)	0.054	-0.177	0.179
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.136	0.006 (0.000)	-0.457	0.010 (0.000)	-0.053	-0.330	-0.381
Year of disaffiliation	-0.142	0.008 (0.000)	-0.463	0.014 (0.000)	-0.055	-0.330	-0.391
After disaffiliation	-0.052	0.007 (0.000)	-0.313	0.012 (0.000)	-0.020	-0.265	-0.208
N	3,295,334						
ρ	0.846	0.001 (0.000)					
σ			1.614				
Log Likelihood	-4,616,915						

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers only; borderline itemizers and non-itemizers are excluded. Estimation also includes year dummies (results not shown). P-values are given in parentheses.

Table 5.3 presents the Heckman estimation results for the sample consisting of regular itemizers and non-itemizers. Again, the hypothesis that the two parts of the giving decision are unrelated can be rejected. However, in this sample the correlation is negative, although it is not as strong as in the sample of regular itemizers only.

In the sample of regular itemizers in Table 5.2 most of the exogenous regressors exert the same direction of influence both on the decision to give and how much to give. The two central regressors price and income show the expected signs at the extensive as well as intensive margin and in both samples. An increase in price (income) decreases (increases) both the probability to give and the amount given. For regular itemizers, the unconditional income elasticity is estimated to be around 1.1, i.e. giving is income-elastic. In contrast, I find that donations react inelastically to changes in price, with an estimated price elasticity of unconditional giving of -0.7. In the sample consisting of itemizers and non-itemizers in Table 5.3, the estimated elasticities are pronouncedly different. The income elasticity is very low while the price elasticity is much higher – above 4 in absolute terms for unconditional giving.

This result is not surprising, since the large group of non-itemizers faces a price of giving of one, and at the same time most individuals do not make a contribution.

Table 5.3: Estimation results and marginal effects of Heckman estimation for total donations of regular itemizers and non-itemizers

	Estimation results				**Marginal effects**		
Variable	**Participation**		**Outcome**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-2.799	0.014 (0.000)	2.575	0.034 (0.000)			
Price (log)	-2.628	0.004 (0.000)	-0.987	0.012 (0.000)	-0.828	-2.134	-4.121
Income (log)	0.122	0.001 (0.000)	0.253	0.003 (0.000)	0.039	0.306	0.243
Type of assessment and gender							
Single male	-0.301	0.002 (0.000)	0.102	0.004 (0.000)	-0.091	-0.031	-0.401
Single female	-0.111	0.002 (0.000)	0.038	0.003 (0.000)	0.047	-0.010	-0.158
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.276	0.003 (0.000)	-0.266	0.005 (0.000)	-0.092	-0.384	-0.519
One	-0.239	0.003 (0.000)	-0.324	0.005 (0.000)	-0.081	-0.426	-0.481
Two	-0.116	0.003 (0.000)	-0.255	0.004 (0.000)	-0.040	-0.304	-0.276
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.122	0.004 (0.000)	0.554	0.007 (0.000)	0.384	1.019	2.140
60-69	0.840	0.003 (0.000)	0.297	0.006 (0.000)	0.272	0.657	1.408
50-59	0.431	0.003 (0.000)	0.002	0.006 (0.737)	0.123	0.194	0.562
40-49	0.260	0.003 (0.000)	-0.054	0.005 (0.000)	0.069	0.064	0.300

30-39	0.131	0.003 (0.000)	-0.073	0.005 (0.000)	0.033	-0.013	0.133
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Region							
East Germany	-0.378	0.003 (0.000)	0.195	0.005 (0.000)	-0.108	0.026	-0.463
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Member	0.344	0.002 (0.000)	-0.194	0.004 (0.000)	0.104	-0.042	0.443
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	0.030	0.006 (0.000)	-0.263	0.010 (0.000)	0.008	-0.249	-0.012
Year of disaffiliation	0.015	0.008 (0.049)	-0.256	0.013 (0.000)	0.004	-0.249	-0.028
After disaffiliation	0.051	0.006 (0.000)	-0.236	0.010 (0.000)	0.014	-0.213	0.018
N	5,014,594						
ρ	-0.443	0.004 (0.000)					
σ			1.295				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers and non-itemizers. Taxpayers are excluded in those years when they are borderline itemizers. Estimation also includes year dummies (results not shown). P-values of t-tests are given in parentheses.

Turning the attention to the effect of type of assessment and gender I find that among regular itemizers females are more likely to give and give more than both married couples and individually assessed males. Looking at conditional giving, i.e. the contribution someone makes given that he or she makes a contribution at all, males give roughly 10 % more and females give 12 % more than married couples. The comparably low unconditional giving of male taxpayers is mainly due to their small probability to make a contribution, while individually assessed female taxpayers are found to be the most generous group since they are both most likely to give and give the most once they make a contribution. The picture changes somewhat when non-itemizers are included in the estimation (see Table 5.3). Now married couples appear to be the most generous group. Individually assessed men have by far the lowest unconditional giving. It is interesting to notice that the estimated differences between men and women remain substantially the same in both estimations, with men showing a lower probability to give than women but more or less the same conditional giving, resulting in

considerably lower unconditional giving. However, the relative position of married couples has changed. As the summary statistics show, the share of married couples is lower when the sample consists of itemizers and non-itemizers then when I consider only itemizers. This suggests that more individually assessed taxpayers are in the non-itemizer group who largely do not declare any donations.

Individuals with more than one child are found to be more generous than taxpayers without children or with only one child. From Table 5.2 it can be seen that the estimates for taxpayers without children and those with one child are quite similar. Both groups are about 12 % less likely to make a contribution than the reference group of taxpayers with three and more children. The conditional amount given by the childless and those with one child is also remarkably lower than that of the reference group, which results in the finding that the unconditional giving of taxpayers without children is 51 % lower than that of taxpayers with three or more children and individuals with one child give 53 % less.[120] However, as the number of children increases to two or three and more, the probability to give as well as conditional and unconditional giving increase. Taxpayers with two children give 36 % less than the reference group. The overall result that differences between individuals without children and those with one child are small, but giving increases when there is more than one child, also holds when one looks at the results for the sample consisting of itemizers and non-itemizers (see Table 5.3).

Concerning age, I find that voluntary giving increases steadily with age. This applies both to the probability to make a contribution and the amount given. Those in the oldest age group have a 41 percentage points higher probability to give than those in the youngest age group, and those in the oldest group who give make a 1.4 times larger contribution than the youngest age group. The results also show that there is a very large difference in giving between the age groups 50 to 59 and 60 to 69, which is mainly due to a significant jump in the probability of giving. Again, the results remain substantially the same when one considers the sample consisting of itemizers and non-itemizers in Table 5.3. In this sample there is also an impressive jump in conditional giving, i.e. in the amount given provided that someone makes a donation, between the age groups 50 to 59 and 60 to 69.

The results, both concerning the sample of itemizers in Table 5.2 and the sample of itemizers and non-itemizers in Table 5.3 suggest that East Germans give considerably less than West

[120] The percentage difference in the amount given can be calculated with the formula: $percentage\ change = (\exp(coefficient) - 1) * 100$ (Hoffmann and Kassouf, 2005: 1305).

Germans. The main reason for this difference is the lower propensity to make a contribution in East Germany. Looking at the sample of itemizers, where the estimated average probability of giving is 47 %, the probability to give is 6 % lower in East Germany compared to West Germany. Turning to the joint sample of itemizers and non-itemizers, the differences are even larger. I estimate a 10 % lower probability of giving in East Germany; however, in this sample only 25 % of taxpayers are estimated to make a contribution. The obvious reason for this result is that the share of itemizers among the taxpayers is much lower in East Germany, probably because the share of church tax payers is significantly smaller. However, the results suggest that even when only itemizers are considered, i.e. when I compare individuals from the two parts of Germany who have the same incentives to make a contribution, giving in East Germany is still lower. The large discrepancy in the likelihood of charitable giving eventually translates to large differences in unconditional giving.

The results in Table 5.2 and Table 5.3 also allow looking at the effect of church membership on giving. In accordance with expectations, I find that non-members have a significantly lower probability of giving than church members. Although this finding is repeated in both samples, the size of the effect is larger in the sample consisting of both itemizers and non-itemizers. While in the sample of itemizers I only estimate a 6 % difference in the probability of giving, the difference is almost 11 % in the joint sample, although the average estimated probability to give is significantly lower in the latter sample. Again, I suspect that the reason for this observation lies in the fact that most non-members are non-itemizers and therefore have a lower incentive to report giving, or are excluded from the sample if they make a contribution and fall into the category of borderline itemizers. Therefore the finding that non-members are less likely to give even when they are itemizers suggests that there actually exists a lower propensity to give among non-members.

However, in both samples I find that the conditional giving of church members is lower than that of non-members. In other words, on the occasion that non-members make a contribution, they actually give more than church members.

These results help to answer my first research question. From the model in Chapter 3 I have derived the hypothesis that church members might be in a “corner solution” where their church taxes exceed the amount of charitable contributions they would like to make and therefore abstain from making voluntary contributions. I cannot confirm this hypothesis. However, my result is in accordance with the overwhelming majority of previous research discussed in Section 5.3.2 that repeatedly found that religious people are more generous than

the non-religious. However, with respect to the amount given, church members do not appear to be more generous than non-members, which is broadly in line with the hypothesis from the model in Chapter 3 that church members might perceive their church taxes as a substitute for donations.

In addition, the results in Table 5.2 help to answer research question three which asks if "regular" church members differ from those who decide to disaffiliate from the church with respect to their giving behavior. The answer is unambiguous: individuals before disaffiliation are less likely to give and give a smaller amount, conditional on making a contribution, than regular church members. The differences are substantial: according to Table 5.2, regular church members are 11 percentage points more likely to give than those who will disaffiliate in the following years. The unconditional giving of those who are about to leave the church is estimated to be 43 % lower compared to regular church members' unconditional giving. In the sample consisting of itemizers and non-itemizers in Table 5.3, the general pattern is the same. These findings concur with the view that individuals who leave the church have a lower marginal utility of giving than "regular" church members.

The charitable contributions of individuals who disaffiliate from the church can also be compared to the contributions of non-members. In the sample of regular itemizers in Table 5.2 I find that individuals "before disaffiliation" and "after disaffiliation" are less likely to give and give a smaller amount than non-members. When one considers the sample including itemizers and non-itemizers (see Table 5.3) the unconditional giving of those who will leave the church soon is roughly the same as that of non-members. Even after disaffiliation, their unconditional giving is only marginally higher than that of non-members. On top of that, the summary statistics show that the share of itemizers among individuals "after disaffiliation" is much higher than among non-members. Consequently, they have a higher incentive to state their voluntary giving. From this I conclude that individuals who have left the church give the same or even less than non-members, provided they face the same incentives. To sum up, all evidence suggests that people who leave the church do not only give less than regular church members, they are in all likelihood even less generous than (or at best as generous as) non-members.

5.6.1.2 Results of Cragg's two-part estimation

As I have discussed in Section 5.5.3, the Heckman estimation results have the disadvantage that they do not fully account for the stratified sampling design. In addition, since I do not use an exclusion restriction when estimating the Heckman model (see also Section 5.5.3), the

results might be estimated imprecisely. Therefore I re-estimate the results with a two-part model. In Table 5.4 I report results for the sample consisting of regular itemizers.[121] The first part of the two-part model is a normal probit model, in which I account for the sampling design, i.e. I apply a SAS procedure that was developed for stratified samples.[122] The results of the probit estimation in the two-part model in Table 5.4 should be similar to those in the first step of the Heckman model in Table 5.2. Differences in the estimated coefficients do not result from accounting for the sampling design, but from diverse estimation techniques. The results of the two-part model below are produced with a simple probit regression, while the Heckman model in Table 5.2 is estimated with the maximum likelihood technique, i.e. the coefficients of the participation and the outcome equation are estimated simultaneously (see Cameron and Trivedi, 2010: 556-561). The second part of the results below – the outcome equation – is estimated with a truncated regression model on the pooled sample of those individuals who have made a donation.

Table 5.4: Estimation results and marginal effects of Cragg's two-part model for total donations of regular itemizers

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-4.865	0.095 (0.000)	-1.575	0.029 (0.000)			
Price (log)	-0.308	0.025 (0.000)	-0.450	0.009 (0.000)	-0.123	-0.450	-0.794
Income (log)	0.418	0.010 (0.000)	0.610	0.003 (0.000)	0.166	0.609	1.076
Type of assessment and gender							
Single male	-0.088	0.006 (0.000)	0.185	0.003 (0.000)	-0.035	0.184	-0.082
Single female	0.082	0.007 (0.000)	0.182	0.003 (0.000)	0.033	0.182	0.245
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

[121] I also produced results for the sample consisting of regular itemizers and non-itemizers. Since they do not differ substantially from the results reported for the Heckman model, I do not report them here.
[122] When the sample is stratified but one applies techniques which are developed for simple random samples and uses sampling weights, the resulting point estimates of coefficients are correct, but their standard errors are not.

Number of children							
None	-0.278	0.005 (0.000)	-0.303	0.004 (0.000)	-0.111	-0.303	-0.695
One	-0.279	0.005 (0.000)	-0.381	0.004 (0.000)	-0.111	-0.381	-0.732
Two	-0.143	0005 (0.000)	-0.279	0.004 (0.000)	-0.057	-0.279	-0.429
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.102	0.007 (0.000)	0.856	0.005 (0.000)	0.416	0.855	2.531
60-69	0.839	0.006 (0.000)	0.554	0.005 (0.000)	0.325	0.554	1.840
50-59	0.451	0.005 (0.000)	0.181	0.005 (0.000)	0.174	0.181	0.884
40-49	0.285	0.005 (0.000)	0.076	0.005 (0.000)	0.108	0.076	0.525
30-39	0.157	0.005 (0.000)	0.004	0.005 (0.388)	0.059	0.004	0.269
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Region							
East Germany	-0.169	0.004 (0.000)	-0.061	0.004 (0.000)	-0.067	-0.061	-0.340
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Church member	0.163	0.004 (0.000)	-0.220	0.003 (0.000)	0.064	-0.220	0.211
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.109	0.009 (0.000)	-0.383	0.008 (0.000)	-0.042	-0.383	-0.353
Year of disaffiliation	-0.115	0.012 (0.000)	-0.386	0.011 (0.000)	-0.044	-0.385	-0.363
After disaffiliation	-0.032	0.010 (0.002)	-0.309	0.009 (0.000)	-0.013	-0.309	-0.188
N	3,295,334		2,014,276				
σ			1.222				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.

Note: Sample consists of regular itemizers only; borderline itemizers and non-itemizers are excluded. Estimation also includes year dummies (results not shown). P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

The estimated coefficients of the participation equation in the two-part model are quite similar to those of the participation equation in the Heckman model, but the estimated standard errors are somewhat larger in the two-part model, resulting in higher p-values. However, even after accounting for the sampling design, the estimated coefficients of all independen variables are highly significant.[123]

In the probit estimation I find that the marginal effect of the price of giving is somewhat larger in absolute terms and the effect of income somewhat smaller than in the first part of the Heckman estimation. Nevertheless, the sign of the estimates accord in both estimations, and the sizes of the effects are still comparable. The significance level of the estimates in the probit model is lower, although both variables are still highly significant. The unconditional marginal effects in the Heckman and Cragg's two-part model are qualitatively similar. Both models predict an income elasticity of roughly 1.1. The price elasticity is estimated to be -0.8 in Cragg's model and -0.7 in the Heckman model.

The estimated marginal effects with respect to type of assessment and gender, number of children, age and region are very close in both estimations. This is true both for the marginal effects on probability and on unconditional giving. There are some small differences in the conditional marginal effects, e.g. in the two-tier model I do not find differences in conditional giving between individuals in the age groups below 30 and 30 to 39.

Cragg's two-part model also largely supports the conclusions drawn from the Heckman model concerning the probability of giving of church members and individuals in the process of disaffiliation. Church members are significantly more likely to give than non-members. In the model at hand, the estimated difference in the probability of giving is 6.4 percentage points and thus even larger than in the Heckman model where it was only 5.4 percentage points. Cragg's model predicts that church members give 23 % more than non-members, while the corresponding number is 20 % in the Heckman model. Both models indicate that the conditional giving, i.e. the amount given conditional on making a contribution, is lower for church members than non-members.

Individuals who disaffiliate from the church are shown to be less likely to give and to give less conditional on making a contribution than both members and non-members. However,

[123] With respect to the probit estimation in Table 5.4 I report p-values which refer to a Wald Chi-Square test, while in the Heckman model I report p-values of a t-test. The p-values reported with respect to the t-test refer to a two-sided test, while the p-values associated with the Chi-squares describe a one-sided test.

the results of both models suggest that they are roughly three percentage points more likely to give after disaffiliation than before.

5.6.1.3 Results of Tobit estimation

Table 5.5 shows the Tobit estimation results for the sample of regular itemizers. Data are pooled for the years 2001 to 2006.

The marginal effects on probability and on unconditional giving in the Tobit model qualitatively support the findings of the Heckman model and Cragg's model with respect to all relevant explanatory variables, although in some cases there are minor differences in the sizes of the effects. There are some differences in the estimated effects on conditional giving.

Table 5.5: Estimation results and marginal effects of the Tobit model for total donations of regular itemizers

	Estimation results		**Marginal effects**		
Variable			**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std. err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-20.920	0.089 (0.000)			
Price (log)	-1.324	0.028 (0.000)	-0.121	-0.509	-0.712
Income (log)	1.877	0.009 (0.000)	0.171	0.722	1.009
Type of assessment and gender					
Single male	-0.281	0.009 (0.000)	-0.026	-0.106	-0.147
Single female	0.410	0.010 (0.000)	0.037	0.162	0.227
Married couple	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children					
None	-1.191	0.013 (0.000)	-0.106	-0.487	-0.688
One	-1.237	0.013 (0.000)	-0.111	-0.504	-0.712
Two	-0.668	0.013 (0.000)	-0.059	-0.282	-0.401
Three or more	*ref.*	---	*ref.*	*ref.*	*ref.*
Age					
70 and above	4.554	0.015 (0.000)	0.389	1.920	2.675
60-69	3.555	0.014 (0.000)	0.314	1.396	1.938
50-59	2.004	0.012 (0.000)	0.181	0.704	0.953
40-49	1.332	0.012 (0.000)	0.120	0.446	0.593

30-39	0.777	0.012 (0.000)	0.070	0.250	0.326
Below 30	*ref.*	---	*ref.*	*ref.*	*ref.*
Region					
East Germany	-0.723	0.012 (0.000)	-0.066	-0.267	-0.368
West Germany	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership					
Church member	0.494	0.010 (0.000)	0.045	0.186	0.259
Non-member	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.672	0.023 (0.000)	-0.061	-0.233	-0.316
Year of disaffiliation	-0.685	0.031 (0.000)	-0.062	-0.238	-0.321
After disaffiliation	-0.295	0.027 (0.000)	-0.027	-0.105	-0.144
N	3,295,334				
σ	4.364				
Log Likelihood	-5,743,006				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers only; borderline itemizers and non-itemizers are excluded. Estimation also includes year dummies (results not shown). P-values are given in parentheses.

The estimated price elasticities for unconditional giving are the same in the Tobit and Heckman model; they are roughly -0.7. The income elasticity of unconditional giving is estimated to be 1.0 in the Tobit model and thus marginally lower than in the Heckman and Cragg's model, where it is 1.1. The Tobit and the probit model (i.e., the first part of Cragg's model) both estimate that a one percentage point increase in income results in a 0.17 % increase in the probability of giving, while the Heckman model predicts an increase by 0.20 %.

All three models predict that single males give somewhat less and single females somewhat more than married couples, although the exact estimates vary. The previous finding that individuals without children and those with one child give about the same, but are substantially less generous than taxpayers with two or more children is also supported by the Tobit model. East Germans are found to be less likely to give and give a smaller amount when they make a contribution in comparison to West Germans. Again, this result appears in all three estimations; estimates for unconditional giving suggest that East Germans give between 28 % (Heckman) and 31 % (Tobit) less than West Germans. Concerning age, the Tobit results also coincide with previous findings. In particular, in the results of all three models one finds a large increase in giving between the age groups 50 to 59 and 60 to 69.

All models predict that church members have a higher propensity to give and give more (unconditionally) than non-members. The estimated unconditional giving of church members (in comparison to non-members) is largest in the Tobit model (30 % higher than giviving of non-members) and somewhat smaller, but still substantial (20 %), in the Heckman model. However, while the Heckman model and Cragg's model predict that the conditional giving of church members is lower than that of non-members, conditional giving of members has a positive sign in the Tobit model. Taxpayers who are about to leave the church give significantly less than non-members (and church members), i.e. both the share of donors and the amount of the contribution are lower, estimates range between 27 % and 32 %. All three models suggest that taxpayers are more likely to give and give more after disaffiliation than before, although their giving is still below the level of non-members and far below the level of members.

5.6.2 The effect of church disaffiliation on giving

5.6.2.1 Results of Heckman estimation

In order to answer my second research question, i.e. whether and how disaffiliation from the church affects voluntary giving, the estimations in the previous subsection have to be interpreted cautiously because there could be a sample selection problem. The sample consisting of itemizers only is unbalanced, since individuals are included in years when they are itemizers and are excluded when they are non-itemizers or borderline itemizers. However, itemization status is connected to church membership, since many individuals who pay church taxes exceed the basic allowance for special expenses with their church taxes, but they do not have sufficiently high special expenses when they stop paying church taxes and are therefore excluded from the sample. As a consequence, the "before disaffiliation" group is not congruent with the "after disaffiliation" group. If, for whatever reason, the individuals who remain in the sample have on average a different inclination to give than those who leave, the disaffiliation effects discussed above might occur as the result of sample selection. Therefore, I re-estimate the equations with a balanced panel, i.e. one that only includes those individuals who are itemizers in all six panel years.

In Table 5.6 I report the results of the Heckman estimation of the sample consisting of individuals who are itemizers in all sample years. This leads to a large reduction in sample size as well as to a change in the composition of the sample. As one would expect, the share of church members in the sample is large and the share of non-members very small, compared to the shares of these groups in the total population. In addition, the average income in the

"balanced" sample is significantly higher, which suggests that individuals with a high income are more likely to itemize their deductions. Consequently, the estimates concerning price and income elasticity and socio-demographic variables should not be given much attention, since they cannot be transferred to the majority of taxpayers or taken as a good estimate for the population as a whole. Still, it is interesting to see that in this "balanced" sample that mainly consists of church members and a few non-members with high income, the price elasticity of giving is much lower than in the larger samples. In fact, I find almost no effect of the price on the probability of giving, while there is a small negative effect on the amount given, provided the taxpayers makes a donation. The unconditional price elasticity at the mean is estimated to be roughly -0.15. In addition, I find that the income elasticity is 1.5, which is larger in the "balanced" sample than in the unbalanced samples.

Table 5.6: Estimation results and marginal effects of Heckman estimation for total donations of regular itemizers in all sample years

	Estimation results				**Marginal effects**		
Variable	**Participation**		**Outcome**		**On pro-bability**	**Condi-tional**	**Uncon-ditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-6.642	0.042 (0.000)	-7.269	0.056 (0.000)			
Price (log)	0.078	0.014 (0.000)	-0.498	0.019 (0.000)	0.031	-0.562	-0.148
Income (log)	0.626	0.004 (0.000)	1.050	0.005 (0.000)	0.249	0.539	1.477
Type of assessment and gender							
Single male	0.016	0.004 (0.000)	0.159	0.005 (0.000)	0.006	0.146	0.105
Single female	0.180	0.004 (0.000)	0.316	0.005 (0.000)	0.071	0.172	0.437
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.332	0.005 (0.000)	-0.520	0.007 (0.000)	-0.129	-0.262	-0.786
One	-0.342	0.005 (0.000)	-0.612	0.007 (0.000)	-0.133	-0.346	-0.848

Two	-0.183	0.005 (0.000)	-0.372	0.007 (0.000)	-0.070	-0.234	-0.489
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.144	0.006 (0.000)	1.886	0.009 (0.000)	0.416	1.040	2.738
60-69	0.868	0.005 (0.000)	1.378	0.008 (0.000)	0.332	0.696	2.017
50-59	0.412	0.004 (0.000)	0.601	0.007 (0.000)	0.163	0.248	0.879
40-49	0.250	0.004 (0.000)	0.365	0.007 (0.000)	0.098	0.145	0.519
30-39	0.123	0.004 (0.000)	0.159	0.007 (0.000)	0.048	0.049	0.239
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Region							
East Germany	-0.062	0.007 (0.000)	-0.027	0.008 (0.001)	-0.025	0.024	-0.106
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Member	-0.044	0.005 (0.000)	-0.487	0.011 (0.000)	-0.017	-0.452	-0.194
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.291	0.014 (0.000)	-0.835	0.023 (0.000)	-0.116	-0.590	-0.859
Year of disaffiliation	-0.288	0.021 (0.000)	-0.876	0.033 (0.000)	-0.114	-0.634	-0.872
After disaffiliation	-0.225	0.014 (0.000)	-0.777	0.022 (0.000)	-0.090	-0.589	-0.738
N	1,879,806						
ρ	0.836	0.002 (0.000)					
σ			1.573				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of taxpayers who are regular itemizers in all sample years. Taxpayers who are non-itemizers or borderline itemizers in any year are excluded. Estimation also includes year dummies (results not shown). P-values of t-tests are given in parentheses.

Turning attention to the effect of church membership, I find that – in contrast to the results in the previous section – church members give less than non-members, both at the extensive and the intensive margin, amounting to an 18 % lower unconditional giving compared to non-members. However, as I have pointed out, this result might be driven by the fact that a

majority of church members, but a small and not representative minority of non-members, are included in the sample.

Those individuals who disaffiliate from the church are found to give significantly less often and give a lower amount than regular members. The effects are large. An individual who will disaffiliate in the following years is found to be almost 10 percentage points less likely to give than a member and has a 41 % lower unconditional giving compared to taxpayers who are members of the church in all year between 2001 and 2006. This reinforces the results in Section 5.6.1, which have already pointed towards a distinctively lower level of generosity among individuals in the process of church disaffiliation.[124]

Looking at the effects of church disaffiliation, I find that the probability to give is lowest in the years before disaffiliation and increases moderately when the individual has left the church. Looking at conditional giving, I do not find any difference between individuals before and after disaffiliation. In sum, this results in a very moderate increase in giving from before to after disaffiliation. While taxpayers who are about to leave the church give 58 % less than non-members, those who have left recently give only 52 % less. As I have pointed out, the increase in giving can be traced back to the higher probability of giving. The differences between the groups before and after disaffiliation are also statistically significant. Both dummy variables have a standard error of 0.014; consequently, the estimated coefficients do not lie in a range of less than two standard deviations from each other. In the year when the disaffiliation actually takes place, unconditional giving resembles that of the years before disaffiliation.

Relating these findings to the hypotheses derived for research question two, i.e. how giving changes from before to after disaffiliation, I conclude that there is some evidence for the hypothesis that individuals start giving after they have disaffiliated. The results suggest that there is a small group of church members who are in a corner solution, i.e. their church taxes are so high that they do not make any additional voluntary contributions. After they have disaffiliated, they start giving. However, I do not find evidence for the hypothesis that the conditional giving of those who make a contribution increases.

[124] The results in Table 5.6 also support the finding of the previous section that individuals who leave the church give less than non-members. The estimated differences in the probability to give and the amount given are even larger in the balanced sample than in the unbalanced sample of Section 5.6.1. However, this result should be interpreted cautiously since non-members in the balanced sample are probably not representative of the population of non-members.

5.6.2.2 *Results of Cragg's two-part and Tobit estimations*

In order to see if the results are robust with respect to changes in the estimation method I present the results of Cragg's two-part model and the Tobit model in Table 5.7 and Table 5.8, respectively.

Table 5.7: Estimation results and marginal effects of Cragg's two-part model for total donations of regular itemizers in all sample years

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-5.876	0.155 (0.000)	-2.877	0.043 (0.000)			
Price (log)	0.004	0.041 (0.930)	-0.310	0.014 (0.000)	0.001	-0.310	-0.172
Income (log)	0.546	0.015 (0.000)	0.756	0.004 (0.000)	0.217	0.756	1.465
Type of assessment and gender							
Single male	-0.030	0.010 (0.004)	0.270	0.004 (0.000)	-0.012	0.270	0.096
Single female	0.141	0.011 (0.000)	0.274	0.004 (0.000)	0.056	0.274	0.427
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.328	0.008 (0.000)	-0.258	0.005 (0.000)	-0.128	-0.258	-0.775
One	-0.330	0.007 (0.000)	-0.363	0.005 (0.000)	-0.129	-0.363	-0.837
Two	-0.173	0.007 (0.000)	-0.252	0.005 (0.000)	-0.067	-0.252	-0.481
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.149	0.010 (0.000)	0.981	0.007 (0.000)	0.418	0.981	2.679
60-69	0.864	0.009 (0.000)	0.658	0.006 (0.000)	0.331	0.658	1.991
50-59	0.414	0.007 (0.000)	0.202	0.006 (0.000)	0.163	0.202	0.878

40-49	0.253	0.007 (0.000)	0.094	0.006 (0.000)	0.099	0.094	0.515
30-39	0.129	0.006 (0.000)	-0.003	0.006 (0.676)	0.050	-0.003	0.235
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Region							
East Germany	-0.077	0.006 (0.000)	0.048	0.006 (0.000)	-0.031	0.048	-0.119
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Member	0.015	0.010 (0.143)	-0.540	0.008 (0.000)	0.006	-0.540	-0.282
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.236	0.021 (0.000)	-0.691	0.018 (0.000)	-0.094	-0.690	-0.831
Year of disaffiliation	-0.228	0.030 (0.000)	-0.746	0.025 (0.000)	-0.091	-0.746	-0.845
After disaffiliation	-0.173	0.020 (0.000)	-0.685	0.017 (0.000)	-0.069	-0.685	-0.713
N	1,879,806		1,286,567				
σ			1.218				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of taxpayers who are regular itemizers in all sample years. Taxpayers who are non-itemizers or borderline itemizers in any year are excluded. Estimation also includes year dummies (results not shown). P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

Cragg's model and the Heckman model produce virtually the same results. There is a minor difference in the estimated price elasticity, which is -0.17 in the two-tier model (compared to -0.15 in the Heckman model). The difference is mainly caused by the fact that in Cragg's model there is no effect of the price of giving on the probability to make donation, while there is a small but significant positive effect in the Heckman model.

Concerning church membership, both models indicate that church members give less than non-members, although the estimated difference between members and non-members in unconditional giving is larger in the two-part model than in the Heckman model. In addition, the Heckman model confirms the finding that individuals are least generous in the years before disaffiliation and unconditional giving increases moderately from before to after disaffiliation. There are some minor differences in the estimates how much the two decisions – whether to give and how much to give – contribute to the low level of giving of individuals

who leave the church. While the two-part model predicts that the probability to give of individuals before disaffiliation is 9 percentage points lower than that of non-members, the difference is 12 percentage points in the Heckman model. In turn, the conditional giving of people who leave the church is estimated to be slightly lower in Cragg's model compared to the Heckman model. Nevertheless, both models agree that the probability of giving increases by 2.5 percentage points from before to after disaffiliation, while the conditional giving is virtually unchanged.

The conclusions concerning church membership and church disaffiliation are also supported by the results of the Tobit model shown in Table 5.8. As I have discussed earlier, some of the Tobit results can diverge from the results of the two-tier and the Heckman model because the Tobit model does not permit the effect of a variable at the extensive and the intensive margin to differ. This happens in the case of the price elasticity, where the other two models find no or even a small positive effect on the probability to give, while the amount given is negatively affected. In sum, the price elasticity in the Tobit model is somewhat larger and the income elasticity is slightly smaller than in the other models, although the general conclusion that giving is inelastic in price and elastic in income is still maintained.

Table 5.8: Estimation results and marginal effects of the Tobit model for total donations of regular itemizers in all sample years

	Estimation results		**Marginal effects**		
Variable			**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-22.236	0.135 (0.000)			
Price (log)	-0.506	0.046 (0.000)	-0.047	-0.214	-0.303
Income (log)	2.138	0.013 (0.000)	0.199	0.903	1.282
Type of assessment and gender					
Single male	-0.113	0.013 (0.000)	-0.011	-0.047	-0.066
Single female	0.540	0.013 (0.000)	0.050	0.234	0.334
Married couple	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children					
None	-1.287	0.016 (0.000)	-0.115	-0.581	-0.828
One	-1.331	0.016 (0.000)	-0.119	-0.599	-0.853

Two	-0.702	0.016 (0.000)	-0.061	-0.330	-0.470
Three or more	*ref.*	---	*ref.*	*ref.*	*ref.*
Age					
70 and above	4.544	0.020 (0.000)	0.383	2.145	2.994
60-69	3.529	0.018 (0.000)	0.315	1.549	2.179
50-59	1.813	0.016 (0.000)	0.172	0.701	0.979
40-49	1.189	0.016 (0.000)	0.114	0.439	0.607
30-39	0.646	0.016 (0.000)	0.062	0.229	0.313
Below 30	*ref.*	---	*ref.*	*ref.*	*ref.*
Region					
East Germany	-0.251	0.019 (0.000)	-0.023	-0.104	-0.148
West Germany	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership					
Church member	-0.293	0.025 (0.000)	-0.027	-0.126	-0.180
Non-member	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-1.276	0.052 (0.000)	-0.120	-0.514	-0.724
Year of disaffiliation	-1.246	0.075 (0.000)	-0.118	-0.503	-0.709
After disaffiliation	-1.002	0.051 (0.000)	-0.094	-0.411	-0.582
N	1,879,806				
σ	4.148				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of taxpayers who are regular itemizers in all sample years. Taxpayers who are non-itemizers or borderline itemizers in any year are excluded. Estimation also includes year dummies (results not shown).

5.6.2.3 Robustness check I: Estimation for only one year

As I have pointed out earlier, the estimated standard errors in the above estimations may be too high and the associated p-values too low, since I use a pooled sample but do not cluster the standard errors. As a result, each observation is treated as if it was a new observation that is independent from all other observations, when in reality the observations of one individual over time can be expected to be correlated and adding another cross-section does not provide a large information value. In order to check if estimates are still significant when there are no clusters in the data, I provide the results of estimations for a single cross-section (where every observation is actually independent) in Table A.8 through Table A.11 in the appendix. I chose the year 2003, because this allows me to compare individuals who have left the church in 2001 and 2002 with those who will leave in 2004 and 2005. I take the mean values of the

pooled cross-sections (instead of the mean values of 2003 only) to calculate the marginal effects because that way possible differences in marginal effects can be traced back solely to differences in the estimated coefficients.

The results in Table A.8 can be compared with those in Table 5.2 since both show the results of a Heckman estimation which is based on a sample that includes only itemizers. Similarly, Table A.9 can be compared to Table 5.4 which both include results of Cragg's two-part model. Comparing the estimated coefficients and the calculated marginal effects shows that there are no substantial differences between the results of the pooled cross-sections and the single cross-section for 2003. In particular, all estimations are consistent with the conclusion that church members are more likely to give, but give a smaller amount provided they make a contribution. However, there are some small but noticeable differences in the price and income elasticities. Compared to the results for the pooled cross-sections, the estimated price elasticity in 2003 is somewhat larger (in absolute value) and the income elasticity is reduced. The conclusion that giving is inelastic in price persists in all four estimations, but Cragg's model for the cross-section of 2003 predicts an income elasticity of below one while all other estimations suggest that the income elasticity is close to but above one. Not surprisingly, the t-statistics are smaller in the cross-section of 2003. Nevertheless, all variables are still highly significant; therefore one can conclude that pooling the observations does not lead to false implications regarding the effect of the relevant variables on charitable giving.

In Table A.10 and Table A.11 in the appendix I show the estimation results for the sample that is restricted to those individuals who are regular itemizers in all sample years. These two tables can be compared to Table 5.6 and Table 5.7 above, respectively. Again, in the single cross-section for 2003 the income elasticity is lower and the price elasticity is higher than in the pooled cross-sections. Regarding the effect of church disaffiliation on voluntary giving, the results based on the cross-section of 2003 point in the same direction as my earlier findings for the pooled cross-sections: individuals who disaffiliate from the church give significantly less than members and non-members, but their probability of giving is moderately higher after disaffiliation than before, while the conditional amount given remains unchanged. Taken together the individuals give somewhat more after they have left the church than before, but still far less than members and non-members. However, the earlier findings concerning the significance of the difference between before and after church disaffiliation cannot be confirmed. In the single cross-section for 2003 the estimates for those

who disaffiliate in the coming years and those who have disaffiliated are not statistically significantly different.

Although the results of the single cross-section for 2003 are in general quite close to those for the pooled cross-sections, they have a significant disadvantage when I want to compare individuals before and after disaffiliation. When I have data for only one year, all I can look at is differences between individuals, i.e. between those who have left the church in 2001 or 2002 and those who are about to leave in 2004 or 2005. However, the original research question is targeted towards changes within individuals over time. Such changes can be captured by fixed-effects estimation.

5.6.2.4 Robustness check II: Fixed-effects panel estimation

In Table 5.9 I show the results of fixed effects estimations. The estimations are executed by conditioning out the means, i.e. the dependent and independent variables are the deviations from the means of the respective variable. Standard errors are corrected for the reduction in degrees of freedom which are caused by subtracting the mean. I restrict the sample to those taxpayers and sample years when the taxpayer actually makes a contribution. Therefore the coefficients only capture the decision how much to give, not the decision whether to make a charitable contribution at all. Consequently, results should be compared to the conditional marginal effects presented above.

The results show that in both samples the price and income elasticities have the expected signs and are significant, but are much smaller in absolute value than in the pooled cross-sections estimations. This suggests that – at least in the short run – individuals react inelastically to changes in the price of giving and income. It also suggests that the larger effects found in the pooled samples might be due to variation between individuals rather than within individuals. The results imply that married couples give significantly more than singles. This is mildly surprising, since in the pooled samples individually assessed taxpayers, especially females, were usually found to be more generous than married couples. As in the pooled cross-sections, individuals with three or more children are found to be most generous, and individuals with one child give less than those with two children or without children. This is in accordance with earlier results where conditional giving of individuals with one child was found to be lowest. The results of the fixed effects estimation also show that giving increases continuously with age, although the size of the effect is much smaller than in the pooled sample. Contrary to earlier findings, there are no significant differences between East and West Germany. In fixed effects approaches the estimation of regional differences is based

on individuals who are mobile between regions. My results imply that the differences in giving between East and West Germany are of a purely cross-sectional nature, probably caused by differences in upbringing or values, which do not change immediately when individuals move.

Table 5.9: Estimation results of fixed effects estimation on the sample of regular itemizers and regular itemizers in all sample years (donors only)

	Regular itemizers		**Regular itemizers in all years**	
Variable	**Coeff.**	**Std.err.**	**Coeff.**	**Std.err.**
Price (log)	-0.201	0.007 (0.000)	-0.144	0.011 (0.000)
Income (log)	0.140	0.002 (0.000)	0.174	0.003 (0.000)
Type of assessment				
Married couple	0.159	0.004 (0.000)	0.158	0.006 (0.000)
Single	*ref.*	---	*ref.*	---
Number of children				
None	-0.038	0.007 (0.000)	-0.034	0.008 (0.000)
One	-0.053	0.006 (0.000)	-0.052	0.008 (0.000)
Two	-0.037	0.006 (0.000)	-0.032	0.007 (0.000)
Three or more	*ref.*	---	*ref.*	---
Age				
70 and above	0.140	0.011 (0.000)	0.150	0.013 (0.000)
60-69	0.102	0.009 (0.000)	0.099	0.010 (0.000)
50-59	0.081	0.008 (0.000)	0.076	0.009 (0.000)
40-49	0.074	0.007 (0.000)	0.066	0.008 (0.000)
30-39	0.033	0.006 (0.000)	0.022	0.007 (0.002)
Below 30	*ref.*	---	*ref.*	---
Region				
West Germany	0.039	0.038 (0.307)	-0.009	0.050 (0.863)
East Germany	*ref.*	---	*ref.*	---
Church membership				
No	0.072	0.008 (0.000)	0.083	0.012 (0.000)
Yes	*ref.*	---	*ref.*	---
N	2,014,276		1,286,567	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: The sample is restricted to those taxpayers who make a positive contribution in the respective year and thus unbalanced. Estimation also includes year dummies (results not shown). P-values for t-test are given in parentheses.

Both fixed effects estimations show that church members give significantly less than non-members. Since results of fixed effects estimations are based on those individuals that experience a change in an independent variable and the variable is defined in such a way that a change in church membership is only registered when individuals disaffiliate from the church, this result suggests that giving increases after disaffiliation. For the sample of regular itemizers, this supports the cross-sectional results. For the sample of regular itemizers in all years the finding is a bit surprising, since my previous results (see Table 5.6) suggest that conditional giving is virtually the same before and after disaffiliation, only the probability to give increases. One explanation for the finding in Table 5.9 could be that the year of disaffiliation is counted as a year when the individual is still a church member. In that year conditional giving was found to be below the level after disaffiliation.

5.6.3 Different types of giving

I now turn to the results for the two types of giving which were introduced in Section 5.4.1, donations to "benevolent, parochial, religious, scientific or especially eligible charitable purposes" and donations to "benevolent, scientific and especially eligible cultural purposes". I have produced results with Cragg's two-part model, Heckman's approach and the Tobit model. Below I will mainly discuss the findings from Cragg's model, although some results which are produced with the Heckman approach can be found in the appendix. Heckman's method and Cragg's approach provide very similar results concerning all marginal effects. In order to improve the readability I will refer to the first type of giving as giving to "religious and charitable purposes" or "donations which are tax deductible up to an amount of 5 % of overall income"; the second type of giving will be called "giving to benevolent, scientific and cultural purposes", "donations which are tax deductible up to an amount of 10 % of overall income", or simply secular giving.

5.6.3.1 Price, income, socio-demographic variables and church membership

As before, I present results for different samples. In this section the focus is on the effect of church membership on the two types of giving, therefore I look at the results derived from the sample of regular itemizers only and of regular itemizers and non-itemizers.

The main results are based on estimations on the sample of regular itemizers carried out with Cragg's method. The findings for giving to religious and charitable purposes can be found in Table 5.10. Results on the same sample, but estimated with Heckman's method, are reported in Table A.12 in the appendix. Since they are similar to the results produced with Cragg's approach, I will not comment on them further. The results for giving to benevolent, scientific

and cultural purposes are reported in Table 5.11.[125] In addition, I present findings for both types of giving for the sample of regular itemizers and non-itemizers combined in Table A.13 and Table A.14 in the appendix.

Table 5.10: Estimation results and marginal effects of Cragg's two-part model for regular itemizers and for donations which are tax deductible up to an amount of 5 % of overall income

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-4.681	0.070 (0.000)	-1.772	0.033 (0.000)			
Price (log)	-0.069	0.018 (0.000)	-0.325	0.010 (0.000)	-0.026	-0.325	-0.245
Income (log)	0.382	0.007 (0.000)	0.631	0.003 (0.000)	0.145	0.630	0.916
Type of assessment and gender							
Single male	-0.059	0.005 (0.000)	0.202	0.004 (0.000)	-0.022	0.202	-0.030
Single female	0.073	0.005 (0.000)	0.193	0.003 (0.000)	0.028	0.193	0.206
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.248	0.005 (0.000)	-0.284	0.004 (0.000)	-0.096	-0.284	-0.580
One	-0.253	0.005 (0.000)	-0.357	0.004 (0.000)	-0.098	-0.357	-0.615
Two	-0.136	0.005 (0.000)	-0.264	0.004 (0.000)	-0.054	-0.264	-0.372
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	0.946	0.007 (0.000)	0.772	0.006 (0.000)	0.359	0.772	2.100

[125] I do not report results for giving to benevolent, scientific and cultural purposes estimated with Heckman's method because the estimation did not converge. However, the available results appear to support the findings from Cragg's model.

60-69	0.715	0.006 (0.000)	0.491	0.005 (0.000)	0.269	0.490	1.474
50-59	0.406	0.005 (0.000)	0.150	0.005 (0.000)	0.146	0.150	0.722
40-49	0.257	0.005 (0.000)	0.050	0.005 (0.000)	0.089	0.050	0.422
30-39	0.133	0.005 (0.000)	-0.020	0.005 (0.000)	0.045	-0.020	0.197
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Region							
East Germany	-0.253	0.004 (0.000)	-0.085	0.005 (0.000)	-0.092	-0.084	-0.455
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Church member	0.212	0.004 (0.000)	-0.273	0.004 (0.000)	0.078	-0.273	0.280
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.079	0.009 (0.000)	-0.431	0.009 (0.000)	-0.027	-0.431	-0.257
Year of disaffiliation	-0.093	0.012 (0.000)	-0.431	0.013 (0.000)	-0.032	-0.430	-0.278
After disaffiliation	-0.039	0.010 (0.000)	-0.332	0.011 (0.000)	-0.014	-0.331	-0.166
N	3,295,334		1,622,645				
σ			1.210				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Estimation also includes year dummies (results not shown). P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

Concerning price elasticity, no coherent picture emerges. In the sample of regular itemizers giving to religious and charitable purposes has a low price elasticity, both at the extensive and the intensive margin. The unconditional price elasticity is only around -0.25 and thus much lower than the price elasticity of total giving which is roughly -0.8. For donations to secular causes the price elasticity is also low, however, it is quite significant in the decision whether to give at all, but plays a minor role for the amount given. In the sample of regular itemizers and non-itemizers the price elasticity is substantial and even larger for religious and charitable giving than for secular giving.

An interesting observation is that income appears to have the same effect on the conditional amount given for both types of giving, which is also similar to the estimate for the marginal

effect on total conditional giving. All estimates are close to 0.6 in the sample for regular itemizers only and roughly 0.36 in the sample of regular itemizers and non-itemizers. For the decision whether to give at all, income appears to be rather important in the sample of regular itemizers when they make a donation to benevolent, scientific and cultural purposes. In the other cases, income has only a moderate effect on the decision on making a contribution.

Concerning the age structure of giving and the number of children, the same structures as for total giving are also found in the separate estimations of the two types of donations.

Region has a decisive effect on which type of donation is made. The large differences between East and West Germany in the probability to give and the amount given that were reported for total giving are even more pronounced when one only considers religious and charitable giving. For total giving I reported earlier that the probability to make a contribution is 7 percentage points lower in East Germany (estimated probability: 41 %) compared to West Germany (estimated probability: 48 %) for the sample of regular itemizers. When one looks at religious and charitable giving only, the difference is 9 percentage points (29 % in East Germany compared to 38 % in West Germany). In contrast, for the purely secular giving one finds that East Germans are even more likely to make a contribution than West Germans (16 % in East Germany versus 13 % in West Germany). The conditional amount given is always lower in East Germany, but the size of the difference is smaller for donations to benevolent, scientific and cultural purposes than for donations to religious and charitable purposes. When one looks at the sample consisting of regular itemizers and non-itemizers, the higher propensity to give for secular purposes in East Germany cannot be maintained. This is probably because the share of non-itemizers who do not have an incentive to report their giving is much higher in East Germany than in West Germany. Nevertheless, the finding that East Germans are more prone towards secular giving and West Germans tend towards religious and charitable giving remains.

A similar pattern as for East Germans and West Germans can also be found for church members and non-members. Church members are much more likely to give to religious and charitable causes (39 % of church members, but only 31 % of non-members make a contribution in the sample of regular itemizers), while I find no differences at all in the propensity to give to secular causes. The conditional amount given by church members is below that of non-members for both types of giving. As a consequence, the unconditional giving with respect to benevolent, scientific and cultural purposes of church members is even slightly below that of non-members.

I also find differences in the probability to give between church members in the years before disaffiliation and non-members for both types of giving. Individuals who leave the church are less likely to make a donation than non-members and regular church members. The conditional amount given is also far below the giving of non-members and even below that of church members.

Table 5.11: Estimation results and marginal effects of Cragg's two-part model for regular itemizers and for donations which are tax deductible up to an amount of 10 % of overall income

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On pro-bability**	**Con-ditional**	**Uncon-ditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-4.328	0.060 (0.000)	-2.002	0.048 (0.000)			
Price (log)	-0.412	0.018 (0.000)	-0.239	0.016 (0.000)	-0.086	-0.238	-0.420
Income (log)	0.278	0.006 (0.000)	0.621	0.005 (0.000)	0.058	0.620	0.342
Type of assessment and gender							
Single male	-0.057	0.005 (0.000)	0.284	0.006 (0.000)	-0.012	0.283	-0.018
Single female	0.085	0.005 (0.000)	0.293	0.005 (0.000)	0.019	0.292	0.125
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.139	0.006 (0.000)	-0.190	0.007 (0.000)	-0.031	-0.189	-0.170
One	-0.154	0.006 (0.000)	-0.282	0.007 (0.000)	-0.034	-0.282	-0.194
Two	-0.079	0.006 (0.000)	-0.210	0.007 (0.000)	-0.018	-0.210	-0.114
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	0.658	0.008 (0.000)	0.793	0.009 (0.000)	0.147	0.792	0.813
60-69	0.543	0.007 (0.000)	0.507	0.009 (0.000)	0.114	0.506	0.589

50-59	0.303	0.006 (0.000)	0.177	0.009 (0.000)	0.055	0.176	0.261
40-49	0.234	0.006 (0.000)	0.093	0.009 (0.000)	0.040	0.093	0.186
30-39	0.181	0.006 (0.000)	0.050	0.009 (0.000)	0.030	0.050	0.136
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Region							
East Germany	0.158	0.004 (0.000)	-0.024	0.006 (0.000)	0.036	-0.024	0.157
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Church member	0.000	0.004 (0.984)	-0.177	0.005 (0.000)	0.000	-0.177	-0.023
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.065	0.011 (0.000)	-0.306	0.014 (0.000)	-0.013	-0.305	-0.097
Year of disaffiliation	-0.058	0.015 (0.000)	-0.287	0.019 (0.000)	-0.012	-0.286	-0.088
After disaffiliation	-0.002	0.012 (0.893)	-0.261	0.015 (0.000)	0.000	-0.261	-0.035
N	3,295,334		660,578				
σ			1.246				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Estimation also includes year dummies (results not shown). P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

5.6.3.2 Church disaffiliation

In Table 5.12 and Table 5.13 I present the results for the balanced sample of regular itemizers in all sample years, which gives the best indication about what happens to charitable giving when individuals disaffiliate from the church.

With respect to price elasticity, the two types of giving differ strongly. While the price has a large negative effect on the probability of giving to benevolent, scientific and cultural purposes, I find a positive effect on the probability to give to religious and charitable purposes. It appears that the result for total giving (where the price has no significant effect on the probability to make a contribution) is a combination of the opposite effects of the two types of giving. In contrast, the conditional amount of giving is moderately negatively affected by the price for both types of contributions. Income has a positive effect on the

probability to give, the conditional and the unconditional amount given, no matter if one looks at contributions to religious and charitable or to secular purposes. However, the picture from the sample of regular itemizers is reinforced: the effect of income on the extensive margin is larger for contributions to religious and charitable purposes, while the effect on the conditional amount given is similar for both types of contributions.

Table 5.12: Estimation results and marginal effects of Cragg's two-part model for regular itemizers in all sample years and for donations which are tax deductible up to an amount of 5 % of overall income

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-5.041	0.110 (0.000)	-2.672	0.047 (0.000)			
Price (log)	0.196	0.031 (0.000)	-0.249	0.016 (0.000)	0.077	-0.249	0.260
Income (log)	0.448	0.011 (0.000)	0.736	0.005 (0.000)	0.175	0.735	1.145
Membership							
Church member	0.041	0.010 (0.000)	-0.575	0.009 (0.000)	0.016	-0.575	-0.160
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.222	0.020 (0.000)	-0.726	0.020 (0.000)	-0.083	-0.725	-0.680
Year of disaffiliation	-0.224	0.030 (0.000)	-0.782	0.029 (0.000)	-0.084	-0.782	-0.702
After disaffiliation	-0.212	0.020 (0.000)	-0.713	0.019 (0.000)	-0.080	-0.713	-0.660
N	1,879,806		1,054,292				
σ			1.212				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Estimation also includes year dummies and dummy variables for type of assessment and gender, number of children, age and region (results not shown). P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

When looking at church disaffiliation, the two types of giving show divergent results. With respect to religious and charitable giving I do not find any significant differences in the probability to give or the conditional amount given between individuals before and after church disaffiliation.

Table 5.13: Estimation results and marginal effects of Cragg's two-part model for regular itemizers in all sample years and for donations which are tax deductible up to an amount of 10 % of overall income

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On pro-bability**	**Con-ditional**	**Uncon-ditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-4.144	0.063 (0.000)	-3.207	0.069 (0.000)			
Price (log)	-0.508	0.023 (0.000)	-0.208	0.024 (0.000)	-0.115	-0.208	-0.556
Income (log)	0.271	0.006 (0.000)	0.740	0.007 (0.000)	0.061	0.739	0.386
Membership							
Church member	-0.101	0.011 (0.000)	-0.345	0.013 (0.000)	-0.024	-0.345	-0.167
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.140	0.024 (0.000)	-0.481	0.030 (0.000)	-0.033	-0.481	-0.225
Year of disaffiliation	-0.136	0.034 (0.000)	-0.515	0.042 (0.000)	-0.032	-0.514	-0.226
After disaffiliation	-0.063	0.023 (0.005)	-0.435	0.026 (0.000)	-0.015	-0.435	-0.141
N	1,879,806		421,072				
σ			1.246				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Estimation also includes year dummies and dummy variables for type of assessment and gender, number of children, age and region (results not shown). P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

In contrast, giving to benevolent, scientific and cultural purposes increases moderately, both at the extensive and the intensive margin. Obviously the small increase in the probability to give that I found with respect to total giving is only caused by changes in secular giving. This largely contradicts my hypotheses derived from the model in Chapter 3, which suggest that

the probability of religious giving should increase, while the propensity to give to secular causes should not be affected. In addition, I expected the amount given to both causes to increase. In the year of disaffiliation the probability to give is virtually the same as in the years before, but the amount given appears to be slightly lower.

5.7 Discussion

5.7.1 Summary of main findings

This chapter has produced ample results with respect to voluntary giving in Germany – with a focus on the role of church membership and church disaffiliation in the giving decision. I have incorporated different samples based on itemization status, employed various estimation methods and looked at two different types of voluntary contributions separately. The discussion has revealed that the choice of the sample (itemizers and non-itemizers; itemizers only) has a considerable impact on the results, e.g. on the estimated price and income elasticities and the effect of church membership. In contrast, the three estimation methods (Heckman's approach, Tobit model and Cragg's two-part model) produce remarkably similar results. However, the results of the fixed effects approach differ.

With respect to total giving in the sample of regular itemizers only, I find that giving is elastic in income, but inelastic in price. Church members are considerably more likely to make a donation than non-members, but their amount given is lower. Individuals who will disaffiliate in the years to come make significantly smaller contributions – both at the extensive and the intensive margin – than members and non-members. Single females give more than both men and married couples, taxpayers with two or more children are more generous than those with one child or without children, giving increases strongly in age, and East Germans give less than West Germans.

When one looks at the sample consisting of itemizers and non-itemizers, the estimated price elasticity is considerably higher and giving is estimated to be very elastic in price, while the income elasticity is low. Individuals who leave the church are estimated to have roughly the same level of generosity as non-members, but are found to be notably less generous than church members. The conclusions concerning type of assessment, gender, age and region are unchanged.

When individuals leave the church, there is evidence for a moderate increase in giving, coming both from cross-section and fixed effects estimations. However, the two estimation approaches differ in that the cross-section results imply that the higher donations after disaffiliation are due to an increase in the probability to give, while the fixed effects estimations additionally suggest that the amount given increases. When looking separately at the two types of giving which I can distinguish in my data, the incresase in giving appears to be caused by an increase in contributions to "benevolent, scientific and cultural" purposes,

while contributions to "religious and charitable" purposes remain constant. Nevertheless, all evidence points to the fact that even after disaffiliation the former church members are less generous than those who have been non-members in all sample years and sizeably less generous than church members.

The findings also indicate that there are indeed good reasons to look at different categories of giving separately. "Benevolent, scientific and cultural" giving reacts more strongly to changes in the price of giving than "religious and charitable" giving. In addition, when one only considers giving to benevolent, scientific and cultural purposes there are no or only small differences in the propensity to give between East Germans and West Germans as well as church members and non-members.

5.7.2 Results on voluntary giving in light of previous research

Previous research based on German income tax data has used different methods, different definitions of variables and also diverse samples. In particular, previous studies have sometimes excluded and at other times included non-itemizers in the sample, which – according to my findings – has a large influence on the results, most notably on the income and price elasticities.

Comparing the estimated price elasticity in my own work with that of previous research, I find that in the sample including itemizers and non-itemizers the elasticity is higher than previous estimates (in absolute terms), while in the sample of regular itemizers only it is lower. In the sample of itemizers and non-itemizers, Borgloh (2012) estimates an unconditional price elasticity of -1.7 in a random effects Tobit model and Bönke, Massarrat-Mashhadi and Sielaff (2013) estimate a price elasticity of -1.1 with a pooled OLS and -1.2 with a pooled Tobit estimation. These estimates are much lower (in absolute terms) than my own estimates of -4. However, my estimates of the first tier of the giving decision are similar to Borgloh's (2012). She estimates a marginal effect in a random effects probit model of -0.9, while my estimate is -0.8 in a pooled probit model.

Turning the attention to the sample of regular itemizers, von Auer and Kalusche (2007) estimate a price elasticity of roughly -1.1 with a Tobit model, while my own estimate is -0.7. Still, the quantile regression by Bönke, Massarrat-Mashhadi and Sielaff (2013) shows that for average amounts of giving, the conditional amount given is inelastic in price, which corresponds to my own findings.

A possible explanation for the low price elasticity in the sample of regular itemizers could be the inclusion of taxpayers with extraordinary income. As I have explained in Section 5.4.7, these taxpayers often face a very low price of giving. If they make only average charitable contributions despite the exceptionally low price they face, the estimated elasticity can be depressed. My own tentative estimates (results not shown) suggest that including taxpayers with extraordinary income significantly depresses the price elasticity.

Previous findings in the literature concerning the income elasticity are heterogeneous. Borgloh (2012) and Bönke, Massarrat-Mashhadi and Sielaff (2013) both use a sample consisting of itemizers and non-itemizers. While the former reports income elasticities ranging from 0.1 (fixed effects) to 0.3 (random effects and random effects Tobit), the latter find income elasticities between 0.8 (OLS) and 1.1 (pooled Tobit). Von Auer and Kalusche (2007) report an income elasticity of 0.7 in a sample consisting of regular itemizers. My own results suggest that the income elasticity is rather low in the sample consisting of itemizers and non-itemizers: the estimates of 0.2 to 0.3 are close to Borgloh's (2012) results. In contrast, I find a rather high income elasticity of 1.1 in the sample consisting of regular itemizers, which is above the estimate of von Auer and Kalusche (2007) and resembles the results of Bönke, Massarrat-Mashhadi and Sielaff (2013).

My findings concerning the type of assessment and gender show that in the sample of regular itemizers single male taxpayers give slightly less, while single female taxpayers give more than jointly assessed married couples. In the sample consisting of itemizers and non-itemizers, individually assessed taxpayers give less than jointly assessed taxpayers, but females are still more generous than males. Both von Auer and Kalusche (2007) and Borgloh (2012) report the same results that I find for the sample of itemizers and non-itemizers. So far, my research is the first to suggest that females might even be more generous than married couples. However, Bönke, Massarrat-Mashhadi and Sielaff (2013) produced diverging results as to whether individually or jointly assessed taxpayers give more. The reason for their inconsistent findings could be that they do not distinguish between male and female taxpayers.

Concerning the presence of dependent children, all my results support the findings of earlier research by von Auer and Kalusche (2007) and Borgloh (2013). As well, my results showing that taxpayers living in West Germany give significantly more than East Germans and that giving increases with the age of the taxpayer are also in line with all existing research I am aware of.

Finally, shifting the attention to the effect of church membership, I find that church members give significantly more than non-members, thereby confirming the results reported by Borgloh (2012) and Bönke, Massarrat-Mashhadi and Sielaff (2013). In my own research, the effect of being a church member is larger in the sample consisting of itemizers and non-itemizers and is comparable to the size of the effect found by the two studies mentioned.

My findings concerning the differential effect of church membership on the probability to give and the amount given complement Buschle's (2009) results. She uses German tax return data of the year 2001 to show that the share of givers is higher among church members than non-members, but the average conditional amount given is higher for non-members than members. My own findings are an advancement to Buschle's results because I control for itemization status, income, price of giving and socio-demographic characteristics, while Buschle reports only cross-tabulations for individually and jointly assessed taxpayers.

To the best of my knowledge, there is no previous research that compares the charitable giving of members, non-members and individuals briefly before their disaffiliation from the church. However, Sommerfeld and Sommerfeld (2010: 56-57) use data from a German survey (the *"Freiwilligensurvey"*) of the years 2004 and 2009 to show that the probability of making a donation strongly increases with church commitment and that the least committed have roughly the same probability to give as non-members. My research points in the same direction; I even find that those who disaffiliate are less generous than non-members.

To sum up, my research suggests that the choice of the sample has a very large influence on the effect of decisive exogenous variables, e.g. on the income and price elasticity. Looking at itemizers and non-itemizers jointly is interesting because a large majority of all taxpayers are covered. However, the share of givers and the amount given by non-itemizers might be underestimated. Looking at regular itemizers only also has substantial disadvantages. The sample size is not only reduced, there is also a bias in the sample. This is because taxpayers with a high income are more likely to be regular itemizers; the same is true for married couples and for church members (who pay church taxes). Presumably as a consequence of the bias towards taxpayers with high income and church members, East Germans are significantly underrepresented. Hence it is challenging to estimate how large the difference in giving is between jointly and individually assessed taxpayers, between church members and non-members and between West Germans and East Germans, because these groups systematically face different incentives to report their true giving in their income tax returns.

In addition, the results of my own study as well as those of von Auer and Kalusche (2007) indicate that it is advisable to distinguish between single male and female taxpayers (instead of putting individually assessed taxpayers of both genders in one group and contrasting them with married couples) because they differ significantly in their propensity to make a contribution. In line with von Auer and Kalusche (2007), I find that the number of children exerts a larger influence on the giving behavior than the simple fact of having a dependent child. Therefore it is advisable to operationalize the family size with the number of children instead of a dummy variable that only indicates the presence of children in the family.

5.7.3 Conclusions regarding the effect of church membership on voluntary giving

The first research question in this chapter is whether church members and non-members differ in their giving behavior. The hypotheses derived from the model in Chapter 3 are that church members are less likely to give (to religious causes) than non-members and that the amount given both to religious and secular causes is lower. However, my discussion of the literature has revealed that the hypotheses derived from the model are questionable. Almost all previous research shows that religious people are more generous than non-religious individuals.

Starting with a look at total giving, my own results are mixed. I find that church members are significantly and in a quantitatively substantial way more likely to make a voluntary contribution – which is perfectly in line with previous research for Germany and many other countries, and refutes my first hypothesis. There appear to be systematic differences in the preferences for giving or incentives to give between church members and non-members. However, with respect to the amount given my hypothesis that church members give less than non-members can be confirmed. I find significant differences in conditional contributions between those who belong to the church and those who do not. This could be interpreted in a way that church taxes and voluntary contributions are substitutes.

When one looks at the two types of giving separately, the findings are more heterogeneous. With respect to religious and charitable donations the results equal those for the total giving. In contrast, concerning giving to benevolent, scientific and cultural purposes I find there are no or small differences in the probability to give (depending on the exclusion or inclusion of non-itemizers, respectively) between those who belong to the church and those who do not. When looking at religious and charitable giving, one should keep in mind that these include local church taxes, which are compulsory in some parts of Germany. Unfortunately, the data does not allow for the detection of how many church members report local church taxes as the

only kind of contribution in the "religious and charitable" category and whether the gap in the probability to give would diminish if local church taxes were controlled for.

Another research question in this chapter is whether those individuals who disaffiliate differ in their giving from church members who do not leave the church. The model in Chapter 3 does not provide an unambiguous answer since the behavior of the individual depends on his or her reason for disaffiliation. If membership benefits are too low there should be no differences in giving. If individuals leave because they disagree with how the church tax is used, they should actually give more than "regular" members. Finally, if they have a lower preference for giving (expressed by β_1 and β_2) they can be expected to give less.

The results clearly show that those who leave the church are significantly less likely to give than church members who stay and the conditional amount given is also lower. The size of the difference in the probability of giving is very persistent in all estimations and is estimated to be roughly 10 percentage points for total giving. The broad gap in giving is also found for donations to religious and charitable causes, but much smaller for donations to benevolent, scientific and cultural purposes. These findings suggest that the third explanation for leaving the church – those who leave have a lower intrinsic or extrinsic inclination to give – might be the predominant one. This finding does not exclude the possibility that people also leave the church because their personal benefits from membership are low. However, I do not find evidence that the majority of those who leave the church disagree with how the church tax is used.

The next question is whether and how voluntary giving changes during the process of disaffiliation, i.e. whether individuals make a larger (or smaller) voluntary contribution after they have left the church than before. The hypotheses are that the probability of (religious) giving and the amount of all types of contributions increase.

The results derived from the estimations for total giving suggest that there is a moderate increase in giving from before to after disaffiliation. The results of the pooled sample are very consistent in showing that there is an increase in the probability of giving, which could indicate that some church tax payers are in a corner solution before they leave. The difference in the estimated probability is significant in the pooled sample where standard errors might be too small (and significance levels too high) because the errors are not clustered. In the cross-section for the year 2003 the difference is not significant. The results of the cross-section estimations consistently show that the conditional amount given is not affected by

disaffiliation. When the two types of giving are considered separately, I only find an increase in the probability to give to benevolent, scientific and cultural purposes. This result is not in line with my hypothesis which predicts an increase in giving to religious purposes.

All fixed effects estimations, which are solely based on the variation between individuals, indicate that total giving increases after disaffiliation. The effect is found when only those who make a contribution are included in the sample, but also when non-givers are added. In the latter case, the difference from before to after disaffiliation is even larger, which might imply that the probability to give also increases.

The results again suggest that church taxes and voluntary giving might be substitutes, although not perfect ones. This result contradicts Borgloh's (2012) finding that the amount of church taxes someone pays significantly increases voluntary contributions, i.e. church taxes and voluntary contributions are complementary. Somewhat surprisingly, it seems that giving to benevolent, scientific and cultural purposes is an (imperfect) substitute for church taxes, while giving to religious and charitable causes is not. A possible explanation could be that individuals (in particular marginal church members) do not primarily perceive their church taxes as a religious contribution, but as a benevolent one, i.e. one that benefits people in need.

Nevertheless, my results suggest that the increase in giving after leaving the church is only moderate and the former members are not very generous, probably even less generous than "regular" non-members. With respect to the probability to give the results are inconclusive, but concerning the amount given, all estimations consistently show that those who have recently disaffiliated give less than non-members.

5.7.4 Conclusions concerning different types of giving

In my literature review I cite a bulk of studies that indicate that the price and income elasticity of voluntary giving depend on which causes benefit from the donation. Therefore I decided to look at the two types of giving which I can distinguish in the Taxpayer Panel data separately. My expectation was that giving to "benevolent, parochial, religious, scientific and especially eligible charitable purposes" was less elastic in income and price than giving to "benevolent, scientific and especially eligible cultural purposes". Indeed I find some evidence that the former reacts less elastically to changes in price than the latter. This could imply that "religious and charitable" giving is either more routinely done or seen as a kind of obligation that does not react strongly to incentives. The finding is also in line with what one would

expect given that "religious and charitable" giving includes not only local church taxes, but also the majority of membership fees to charitable associations.

My findings do not confirm the results of much of the previous literature (mainly from the US) that religious giving is less elastic in income than secular giving. One reason could be that the two types of giving I distinguish are very heterogeneous and that the "religious and charitable" category contains more than only religious giving. However, it could also be the case that due to the existence of the church tax in Germany the remaining religious giving serves different purposes than religious giving in the US. If one assumes that church members need to achieve a certain level of contributions to religion (e.g. to ensure afterlife consumption), then the church tax in Germany might constitute such a minimum contribution, while the additional religious donations might be driven by this-worldly considerations such as altruism, warm glow or social approval.

I find that both the region and the church membership status affect the two categories of giving very differently. While East Germans are significantly less likely than West Germans to give to religious and charitable purposes, they profess roughly the same inclination to give to benevolent, scientific and cultural purposes as West Germans. The higher religious and charitable giving in West Germany is far from surprising, since not only the significance of religious institutions in society is higher than in East Germany, but also membership rates in associations. However, I am not aware of any research that elaborates on the remarkably high inclination of East Germans to give to benevolent, scientific and cultural purposes.

The results further suggest that there is no strict separation between causes that are preferred by church members and those that are preferred by non-members, at least not in the very rough classification with only two types of giving. The propensity to give to benevolent, scientific and cultural purposes appears to be largely independent from church membership status. In contrast, church members are much more likely to make a contribution to religious and charitable causes. With respect to both types of giving I can conclude that the conditional amount given is higher for non-members than for church members.

5.7.5 Conclusions concerning estimation methods

In order to test the robustness of results, I executed the pooled estimations with three different estimation methods: the Tobit, the Heckman and Cragg's two-part model. All three methods produced remarkably similar results when it comes to the marginal effect of the independent variables on the probability of giving and the unconditional amount of giving. With respect to

conditional giving, the estimates of the Heckman model and Cragg's model have the same sign and are generally broadly of the same size (with the exception of the price and income elasticity, where differences in the estimates are notable in some estimations). The estimated marginal effects on conditional giving in the Tobit model do differ sometimes from the Heckman and the two-part results. In addition, the Tobit model is not able to reveal when marginal effects at the extensive and intensive margin do not coincide. For example, the Tobit model does not reveal that church members are more likely to give than non-members while at the same time their conditional giving is lower than that of non-members. This deficiency of the Tobit model is caused by its construction, which forces the effects on the probability of giving and the amount given to be the same. As a result, the Tobit model performs worse in fitting the data than the models that consider the two parts of the giving decision separately. This can be seen by comparing the log likelihoods of the models. The log likelihood value of the Heckman model for total giving of regular itemizers (see Table 5.2) is -4,616,915, while it is -5,743,006 in the Tobit model on the same sample (see Table 5.5). A higher log likelihood value indicates a better fit since the idea behind the maximum likelihood estimation is to maximize the likelihood value.

In general, it is advisable to use estimation techniques that allow modeling the giving decision both at the extensive and the intensive margin, since these are obviously two different decisions. For the focus of this chapter – the effect of church membership and church disaffiliation on giving – the separation of the two steps of the giving decision provides valuable insights which would not appear in Tobit or simple OLS estimations.

Furthermore, the remarkably similar estimation results from the Heckman and Cragg's two-step method suggest that using the same exogenous variables in both parts of the Heckman method is possible in this data set, despite the theoretical issues concerning this approach expressed by Wooldridge (2002: 564) and Cameron and Trivedi (2010: 558-561).

In addition to the pooled cross-sections I also apply fixed effects estimation. This technique is particularly interesting in answering the question how giving changes from before to after church disaffiliation, because such a change is within individuals. If taxpayers who disaffiliate in 2001 or 2002 differ systematically from those who leave the church in 2004 or 2005, then the results based on pooled cross-sections could be biased since they are strongly driven by between-individual variance. As I have discussed earlier, the results from the various pooled cross-sections and from the fixed effects estimation both indicate that there is a moderate increase in giving from before to after disaffiliation, but the cross-section results imply that

the cause for this increase is a rising probability to contribute, while the fixed effects results also point towards an increase in the amount given. Concerning income and price elasticity, the fixed effects estimation suggests that both elasticities are much lower than what one finds in the cross-sections. Borgloh (2012), who also conducted a fixed effects estimation, reports similar results. The reason for the lower estimates could be that in the fixed effects estimation I incorporate only transitory changes in income and price because I do not control for the effects of past and future changes in income and price or for permanent income. According to recent findings by Bakija and Heim (2011), transitory changes in income and price of giving lead to less elastic reactions than permanent changes.

5.7.6 Open questions and suggestions for further research

A starting point for further research could be to interact type of assessment, gender and church membership and to discriminate between married couples consisting of one or two church members. In my research, a married couple is treated as a church member when at least one spouse is a church member. However, previous research by Buschle (2009: 99-100) shows that there are significant differences in the propensity to give between couples consisting of two church members and those where only one partner is a member of the church. My own tentative estimations (results not shown) also suggest that it may be necessary to distinguish between couples where the husband is in the church and those where the wife is a church member. Couples where only the wife is religious appear to give significantly less than couples where only the husband is a church member. Such a result is not too surprising because anecdotal evidence suggests that couples where only the wife is a church member often make their church membership decision from an economic point of view. The wife, who usually earns less than her husband, is a church member in order to benefit from services provided by the church, such as child care, while the husband disaffiliates and reduces the church tax liability of the couple. If the church membership decision is guided by such economic cost-benefit-calculations, these couples might also be less generous towards (non-religious) charitable organizations. Another possible explanation is that in the majority of married couples the husband is responsible for making financial decisions such as making charitable contributions; therefore his church membership status has a larger effect on the couple's giving than the wife's church membership.

In a similar vein it would be possible to interact the church membership variable with the region. Here preliminary results (not shown) suggest that church members in West and East Germany do not differ much in their probability to give, but non-members in East Germany

are far less generous than non-members in West Germany, resulting in a much more pronounced difference in giving between members and non-members in East Germany as compared to West Germany. Furthermore, one could ask whether Protestants and Catholics differ systematically in their giving behavior and in the adjustment of their giving behavior to church disaffiliation.

Another interesting avenue for further research could be the distinction between transitory and permanent effects of changes in variables. First results on permanent and transitory price and income elasticities for Germany are provided by Borgloh (2012). I abstain from doing these estimations since my focus in this chapter is on the effect of church membership, not in estimating the reactions of giving to income and price. However, permanent and transitory changes need not only play a role when one looks at income and price, they could also be relevant with respect to church disaffiliation. Different hypotheses are possible: individuals might increase their giving immediately when they leave the church in order to reach their preferred level of giving. However, they might also increase their giving gradually because they need to find organizations that they want to support, which was not necessary when they only made a contribution in the form of the church tax. From a theoretical point of view my results include both transitory (short-run) and medium-run effects since I treat all years before disaffiliation and after disaffiliation as the same.

My research has also provided some evidence that giving behavior depends on the purposes for which the contribution is made. More research could be done here. In particular, it would be helpful to have access to more detailed information on the purposes of giving in order to develop more homogeneous and comprehensive categories of giving. It might also be illuminating to use different estimation techniques that allow for the simultaneous determination of different kinds of contributions.

6 CONCLUDING REMARKS

The aim of this research is to investigate the economic causes and consequences of church disaffiliation, both from a theoretical and an empirical point of view. I elaborate on the importance of the institutional framework of (formal) church membership and the design of the church financing system. While I compare three different institutional frameworks of church membership in the theoretical part of the dissertation, I focus on the case of Germany in my empirical research.

The literature survey on religious consumption choices in Chapter 2 has shown that there is a wide range of aspects that have already been covered comprehensively by previous research. Models take into account that being religious entails both current and afterlife utility, that time, money, or both can be necessary inputs in the production of religiosity and that uncertainty may influence individuals' choices. In addition, models with one, two or multiple periods have been presented and choices have been modeled as either continuous or discrete. However, I conclude that most of the previous work does not pay sufficient attention to the institutional framework in which religious communities operate. Often the implicit institutional background appears to be the liberal system in the US where citizens are completely free to determine the amount of time and money they want to spend on religious consumption and can freely choose their preferred level of religiosity. However, such models are not well suited to describe the situation in many European countries where the religious market is more regulated (often by the state) and individuals are forced to make discrete choices concerning their church membership.

The outstanding characteristic of the German institutional framework is that church membership is officially registered and entails the duty to pay church taxes that are strictly dependent on taxable income. In Italy, church membership is at the discretion of the individual, but all citizens have to assign a fixed part of their income tax either to a religious community or to the state. In both Germany and Italy individuals cannot earmark the church or assignment tax for a specific cause. Nevertheless, they are free to make additional charitable contributions to both religious and secular causes.

Since institutional settings differ, individuals face completely different optimization problems. In the US, they equate the marginal pecuniary and time costs of membership with the marginal benefits from an increase in their level of religiosity. In Germany, individuals need

to make a discrete decision about membership in which they compare the total costs of membership (which mainly consist of the church tax) with membership benefits. Some of the discrete choice models that I have discussed in Chapter 2 prove to be helpful; however they disregard the quite significant fact that in Germany monetary inputs into religiosity are exogenously determined and depend on a secular variable such as income, not on the preferred level of religious consumption. In Italy, financial concerns should not influence church membership or church involvement, but individuals have to decide whether they want to assign their tax to the church or to the state. The existing models which I have reviewed in Chapter 2 do not contribute to explaining the Italian case, since all models start with the assumption that monetary inputs in religion entail some kind of religious benefits.

In Chapter 3 I proposed a theoretical model that addresses the gaps in research that were discussed in the previous paragraphs and incorporates an important part of the institutional framework, namely the church financing system, into the decision-making process concerning religious consumption. I present a general framework which I adjust to the specific institutional settings in a voluntary contribution, a church tax and a tax assignment system. I focus on two different phenomena which then become the basis for the two empirical chapters: church disaffiliation and voluntary giving.

In my simple model with only one time period individuals possess monetary resources which they can spend on consumption, and religious and secular charitable activities. Depending on the specific church financing system, religious and secular contributions can be either voluntary or obligatory, i.e. raised in the form of taxes on income. While voluntary contributions can be earmarked, taxes cannot.

The first overall research question in this model framework is whether the institutional setting has an influence on the church membership decision. The model shows that the institutional setting can indeed affect the church membership decision, e.g. when membership is contingent upon requirements such as paying an externally fixed amount of church taxes. Consequently, the institutional framework will only affect church membership in a church tax system such as the German one, whereas it should have no effect in a voluntary giving system where each individual can determine his or her contribution independently, or in the Italian tax assignment system, where taxes are decoupled from membership. In Italy or the US spiritual considerations (captured in the model by the membership benefits) should prevail, whereas an economic cost-benefit analysis should take place in Germany. The cost-benefit aspect is aggravated by the fact that church taxes in Germany are completely independent

from religious benefits, but depend on the secular variable income, which is not correlated with religious benefits in my model. In other words, the model predicts that in Germany individuals with a higher income and those who have to pay a higher church tax rate, are more likely to disaffiliate from the church and/or be non-members. In addition, individuals are expected to leave the church when church tax revenues are not used according to their preferences. In Italy, by contrast, one should not find a correlation between church membership and income[126] and individuals are expected to pay less attention to the use of the assignment tax by the church when they make their membership decision. The model predicts that dependent on the church financing system religious communities need to consider different variables when they want to maximize their membership or their revenues.

The second research question in the context of the model is if the institutional framework regarding church membership and church financing also affects religious and secular voluntary giving. I find that in a church tax and a tax assignment systems the institutional framework can bias the giving decision in comparison to a voluntary giving system, which I define as a benchmark. The bias occurs when at least one of the following two conditions is fulfilled: (1) the (church or assignment) tax exceeds the amount which would be given on a voluntary basis and/or (2) the tax is not used in accordance with the preferences of the taxpayers.

In general, the model predicts that in tax systems total giving, i.e. the sum of taxes and voluntary contributions, is higher than without the tax in place, but that taxes crowd out donations. In the church tax system, all taxes belong to the church, therefore the church tax system boosts the total revenues of the church and depresses the revenues of secular organizations. Church members are expected to make a smaller amount of charitable contributions than non-members, but when they disaffiliate from the church they should adjust their giving behavior to that of non-members. In the case of the tax assignment system, the relevant question is whether the tax is assigned to the church or the state. The model predicts that there should be competition between church and state for the assignment of the tax, with the fitting parameter being the relevant variable for the two institutions. If such competition is in place, the use of the money will more closely resemble the preferences of the taxpayers than in a church tax system. This poses a lot of interesting research questions for countries with a tax assignment system: Is there competition between religious communities and the state for these taxes? Is there competition between different religious communities?

[126] This hypothesis is derived under the assumption that benefits from church membership are independent from income or social status.

Which instruments are used in this competition? Can one observe rent-seeking behavior? If there is no competition, why not? The model also produces some testable hypotheses on the tax assignment system: for example, the decision as to who receives the tax assignment should depend on the individual's approval of the use of revenues by the church or the state, but should be independent from the taxpayer's income and the tax rate.

The model also touches the question of social welfare, but cannot answer it, since it focuses only on the individuals who make voluntary and/or obligatory contributions to charitable organizations, but disregards how these contributions are used. The model shows that the church tax system and the tax assignment system can raise the revenues of religious and secular charitable organizations above their benchmark level, i.e. the level without a tax system in place. If the organizations receiving the contributions with the tax system in place had some efficiency, knowledge or scale advantage over those who benefit in the voluntary giving system, or if the taxes contributed to the creation of a public good which is underprovided otherwise, then tax systems might increase total welfare. Answering this question is a possible road for future research.

In Chapter 4 I focus on the case of Germany. I review the hypotheses concerning church disaffiliation which I derive from my theoretical model and then test them using the Taxpayer Panel for the years 2001 to 2006. The main research question is whether the institutional framework in the form of the existing church tax regulations has a statistically significant effect on the decision to leave the church. My main hypothesis is that *ceteris paribus* an increase in the price of church membership increases the probability that an individual disaffiliates from the church. A challenge in the data set is that the main source of variation in individuals' church tax payments are changes in income. While the financial burden of being religious increases, it is not clear *a priori* if the individual's disutility from paying church taxes also increases, since a higher level of income can result in a lower marginal utility of income. This problem is solved by taking into account all the existing regional variation in church tax regulations and by including in the estimations a measure of economic income which is not perfectly correlated with taxable income and the church tax.

The results show that the price of church membership has a significantly positive effect on the probability of church disaffiliation in my sample of individually assessed, unmarried taxpayers. The same effect is found for the subsamples of men and women and Protestants and Catholics. However, the magnitude of the effect is rather moderate, i.e. the price elasticity is low, and church taxes explain the considerable number of church disaffiliations in Germany

only in part. In addition, there is some evidence that church disaffiliation decisions are characterized by inertia.

The second and third research questions in Chapter 4 investigate which demographic, socio-economic and regional variables affect the church membership decision. In my theoretical model from Chapter 3 such characteristics affect the benefits from church membership, but also how the individual judges the use of church tax revenues by the church and his or her preferences for charitable giving. According to expectations I find that individuals are far more likely to disaffiliate when they are young. A traditional gender pattern can only be found to a limited extend when individuals have children, whereas there are no gender differences in the probability of leaving the church among childless taxpayers. My results suggest that income has almost no effect on church disaffiliations. I find that there are sizable regional differences and that interregional mobility is connected to a substantial increase in the propensity to disaffiliate.

There are various starting points for further research. Since the literature on church taxes and church disaffiliation is still scarce – I am aware of only two previous studies which research this topic with comprehensive tax data – future research could be conducted in other countries where church tax systems exist and different econometric methodologies could be used. For Germany, it would be illuminating to see how married couples make church membership decisions. In addition, it would be interesting to discuss the role of transaction costs in more depth than what I can provide in the present research, and to look at the effect of mobility in the church membership decision since this topic has not received much attention in the literature to the best of my knowledge. Finally, it might be interesting to see if church disaffiliation has any consequences for individual behavior.

This last aspect is the starting point of my second empirical chapter in this dissertation. Based on the model in Chapter 3 I ask (1) if church members and non-members differ in their voluntary giving (excluding church taxes) and (2) if the giving behavior changes from before to after disaffiliation. In accordance with my theoretical model, but also with current literature on voluntary giving, I distinguish between two steps in the giving decision: first, whether to make a contribution at all (the extensive margin) and second, how much to give (the intensive margin). The reasoning is the same with respect to both research questions: when individuals are church members, they are forced to make a contribution in the form of church taxes. Paying church taxes reduces the available income and is an (imperfect) substitute for (religious) voluntary contributions. If the amount of taxes exceeds individuals' preferred level

of giving, they will find themselves in a corner solution and make no additional voluntary contributions at all. When they leave the church and paying church taxes is no longer obligatory, they leave the corner solution and can be expected to start giving. In addition, church members can be expected to give a smaller amount of money, but increase their contributions when they leave the church. The difference between the two research questions (comparing church members and non-members and comparing the contributions before and after disaffiliation) is the perspective. The former is cross-sectional, i.e. different individuals are compared. The latter is longitudinal, i.e. individuals are observed over time. I account for these two perspectives by defining different samples and using diverging estimation methods.

The results imply that church members are not less, but rather more likely to make a charitable contribution than non-members. This contradicts my hypothesis and suggests that one of the assumptions in my theoretical model may be wrong. A possible explanation for this observation, which is also in line with previous literature on religion and voluntary giving, is that church members have a higher marginal utility from giving, either because they are more altruistic or because giving is highly rewarded by their social environment. However, I do find that the average amount given by church members is below the amount given by non-members. This finding suggests that church taxes and additional voluntary donations are substitutes. With respect to church disaffiliation, I find evidence that giving is higher after individuals have left the church than before. However, results are inconsistent in whether the increase is due to a higher inclination to give, a higher amount given by those who make a contribution, or both. There is some evidence that a few of those who leave the church are in a corner solution and start making voluntary contributions after they leave, but also some indication that they increase the amount given, which would point to a substitution between church taxes and voluntary contributions. In any way, I find that the increase in giving from before to after church disaffiliation is moderate and it appears highly unlikely that it fully compensates the reduction in revenues of the charitable sector when individuals do not pay church taxes anymore.

Another research question in Chapter 5 is whether those individuals who leave the church differ in their giving behavior from church members who stay. Since some individuals leave the church, while others do not, there must be a difference between the two groups. If they differ in their benefits from membership only, there will not be any differences in giving. If those who leave disagree with how the church tax they pay is used, they can be expected to make higher additional contributions than church members who stay in the church. Finally, if

one assumes that some people receive a higher marginal utility from giving than others, then those who leave the church might not have a high intrinsic motivation or extrinsic incentives to give. In that case, they would give less than church members and behave more like non-members. My results imply that the last explanation applies: individuals who disaffiliate have a lower probability to give and make lower conditional contributions than "regular" church members.[127]

I also provide – to the best of my knowledge – the first set of separate estimations for the two categories of giving which can be distinguished in the German income tax law: donations to "benevolent, parochial, religious, scientific or especially eligible charitable purposes" and donations to "benevolent, scientific and especially eligible cultural purposes". From my results no comprehensive picture emerges as to whether income and price affect the two types of giving separately. However, I find some indication that the price elasticity of giving to the purely secular causes might be higher than to other causes. The results very clearly show that church members and West Germans are over-represented among those who give to religious and charitable purposes, but not among those who give to benevolent, scientific and cultural purposes. This finding contradicts my model in Chapter 3 which predicts that church tax payers give less to religious causes than people who are not church members because the church tax and donations to religious causes are substitutes. In addition, further results imply that after church disaffiliation giving to religious and charitable causes remains constant, while giving to benevolent, scientific and cultural purposes increases. This finding does not support my hypothesis that the probability of giving to religious causes increases when individuals disaffiliate. Different explanations are possible. First, the categories may be too broad and the results emerge because the effects of the non-religious giving in the religious and charitable category dominate the results. Second, religious giving also includes local church taxes, which are obligatory in some regions of Germany. Third, "regular" church members might prefer religious over secular giving, i.e. they derive very little utility from secular giving, causing them to make charitable contributions only to religious organizations, even though church taxes and (religious) voluntary contributions are substitutes at the margin. Although more research in this field is necessary to expand and deepen the results in this chapter, the finding that the price elasticity of voluntary giving might depend on the type of organization which is supported by the donation also has political implications. In order to increase the efficiency of the support for voluntary giving in the tax system those categories

[127] This does not rule out the possibility that they also have a lower membership benefit on average, which seems likely given the findings in Chapter 4 that demographic, socio-economic and regional variables, which are likely to affect the benefits of church membership, have a strong influence on the membership decision.

of giving with the highest price elasticity should see the most comprehensive possibilities for tax deductions. Until 2006 donations to "benevolent, parochial, religious, scientific or especially eligible charitable purposes" were deductible up to 5 % of overall income, while donations to "benevolent, scientific and especially eligible cultural purposes" were deductible up to 10 % of overall income. In other words, when the donations was considerably large (in relation to overall income), the price reduction was higher for the type of giving that appears to be more price elastic. Since 2007, the deductibility of both types of giving is identical (although much higher than before).

Relating the results of the two empirical chapters back to the theoretical discussion of church financing systems, I find only some theoretical predictions confirmed. On the one hand, my research has provided evidence that at least some individuals actually leave the church in Germany because of the church tax. On the other hand, the very moderate increase in giving after church disaffiliation suggests that people do not completely substitute the church taxes they save after leaving the church by voluntary contributions.[128] Taken together, the results imply that total charitable contributions (including both church taxes and voluntary contributions) might decrease when Germany becomes more and more secularized.

If a tax assignment system was introduced in Germany instead, both church membership decisions and charitable choices should be different. First, since the tax assignment system does not provide any incentives to leave the church, church membership rates will be higher and disaffiliation rates lower. Second, nobody would be able to free-ride on the contribution of others, since every taxpayer is forced to assign a part of his or her taxes to a charitable cause, be it religious or secular. An economic evaluation of the efficiency of church financing systems hinges on the welfare effects that can be attained. If individuals value the goods produced by charitable organizations, but free-ride on the contributions of others (especially in the form of church taxes), introducing an assignment tax appears efficient. However, if voluntary charitable contributions are low because there are no charitable causes which individuals prefer to support or because they think that the church and/or secular charities are less efficient in providing services for the needy than other institutions (e.g. the state via general taxes), then the assignment tax would reduce welfare. While this research illuminates the mechanisms at work, an empirical evaluation of welfare effects is beyond its scope.

[128] The present research does not provide an estimate how large the substitution of church taxes by voluntary contributions is, but given the very moderate increase in the probability of giving of 2.5 percentage points which I find in my pooled cross-section estimations (with no increase in the amount given) it is safe to assume that not everyone who formerly paid church taxes begins making voluntary contributions.

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APPENDIX

Appendix A: Extensions of the models in Chapters 2 and 3

A.1 A life-cycle model of religiosity with afterlife and current religious consumption

This section presents the model which was briefly verbally discussed in Section 2.2.3.3. It combines the models in Section 2.2.3.1 where individuals derive utility from afterlife consumption and in Section 2.2.3.2 where individuals have current religious consumption. The utility function now includes both current religious consumption in each period t and afterlife consumption:

$$U = U(C_1 \dots, C_t \dots, C_n, R_1 \dots, R_t \dots, R_n, R_A), \quad t = 1, \dots, n \tag{A.1}$$

All three commodities are produced by inputs of money and time:

$$C_t = C_t(h_{Ct}, m_{Ct}) \tag{A.2}$$

$$R_t = R_t(h_{Rt}, m_{Rt}) \tag{A.3}$$

$$R_A = R_A(h_{R1} \dots, h_{Rt} \dots, h_{Rn}, m_{R1} \dots, m_{Rt} \dots, m_{Rn}) \tag{A.4}$$

The budget constraint remains the same as in the two basic models in Sections 2.2.3.1 and 2.2.3.2. Maximization of the Lagrangian function yields the following first order conditions:

$$\frac{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial h_{Rt}}\right) + \left(\frac{\partial U}{\partial R_A}\right)\left(\frac{\partial R_A}{\partial h_{Rt}}\right)}{\left(\frac{\partial U}{\partial R_{t-1}}\right)\left(\frac{\partial R_{t-1}}{\partial h_{Rt-1}}\right) + \left(\frac{\partial U}{\partial R_A}\right)\left(\frac{\partial R_A}{\partial h_{Rt-1}}\right)} = \frac{w_t}{w_{t-1}(1+i)} \tag{A.5}$$

$$\frac{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial m_{Rt}}\right) + \left(\frac{\partial U}{\partial R_A}\right)\left(\frac{\partial R_A}{\partial m_{Rt}}\right)}{\left(\frac{\partial U}{\partial R_{t-1}}\right)\left(\frac{\partial R_{t-1}}{\partial m_{Rt-1}}\right) + \left(\frac{\partial U}{\partial R_A}\right)\left(\frac{\partial R_A}{\partial m_{Rt-1}}\right)} = \frac{1}{1+i} \tag{A.6}$$

It is easy to see that the results are a combination of the results of the two basic models and that they can be traced back to previous findings if the individual does not include one of the two types of religious consumption in his or her utility function, e.g. because he or she does

not believe in the existence of an afterlife.[129] Including both types of religious commodities in the utility function makes it even more difficult to predict an age profile of religiosity. In general, one would expect to see religious contributions of time and money increase over the life-cycle. This effect is more pronounced if learning effects exist, i.e. inputs in religion during childhood and youth increase the productivity of inputs in later stages of life. In contrast, a steep increase in wages mitigates the age effects. In addition, inputs into religion can vary according to the need for current religious consumption, which influences the marginal utility of religiosity.

Looking at the decision making of the individual in a specific period t, I find that the individual simultaneously takes into account the marginal effects of an increase in religious inputs on current utility from religion and afterlife utility:

$$MU(R_A) * MP(h_{Rt}) + MU(R_t) * MP(h_{Rt}) = MU(C_t) * MP(h_{Ct}) \quad \text{(A.7)}$$

$$MU(R_A) * MP(m_{Rt}) + MU(R_t) * MP(m_{Rt}) = MU(C_t) * MP(m_{Ct}) \quad \text{(A.8)}$$

where $MU(.)$ is the marginal utility of the commodity in brackets and $MP(.)$ is the marginal productivity of the respective input. Both high current benefits from religiosity and high utility from afterlife consumption induce individuals to engage in religion. Tao and Yeh (2007) use this framework to analyze different religious convictions in Taiwan. They argue that Christians have the highest afterlife utility because in their belief system eternal life is promised. In contrast, Buddhists have lower afterlife benefits because all they can gain is a better starting position in their next life. Finally, folk religionists cannot influence their afterlife through religious inputs during their lifetime. Assuming that all religious groups have similar current benefits from religion, one would expect Christians to choose a higher level of religious inputs than Buddhists, and members of folk religions to have the lowest religious inputs.

A.2 Joint household production of religiosity

The following model is adopted from Azzi and Ehrenberg (1975). The authors assume that husband and wife jointly produce current religious consumption in each period

$$R_t = R_t(h_{Rt}^{hu}, m_{Rt}^{hu}, h_{Rt}^{wi}, m_{Rt}^{wi}) \quad \text{(A.9)}$$

as well as the secular consumption good

[129] For a more detailed analysis of believes in the afterlife, see Section 2.2.7.2.

$$C_t = C_t(h_{Ct}^{hu}, m_{Ct}^{hu}, h_{Ct}^{wi}, m_{Ct}^{wi}) \tag{A.10}$$

where the superscripts hu and wi identify husband and wife, respectively. The spouses also have a joint budget constraint

$$\begin{aligned} &\sum_{t=1}^{n}\{[m_{Rt}^{hu} + m_{Rt}^{wi} + m_{Ct}^{hu} + m_{Ct}^{wi}]/\delta_t\} \\ &= \sum_{t=1}^{n}\{[\tilde{y}_t + w_t^{hu} * (H - h_{Ct}^{hu} - h_{Rt}^{hu}) + w_t^{wi} * (H - h_{Ct}^{wi} - h_{Rt}^{wi})]/\delta_t\} \end{aligned} \tag{A.11}$$

where w_t^{hu} and w_t^{wi} are the wage rates of husband and wife, respectively.

The spouses now determine their optimal combination of monetary and time inputs into religiosity. Looking at time spent with religious activities in period t yields

$$\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial h_{Rt}^{hu}}\right) = \lambda w^{hu} \tag{A.12}$$

$$\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial h_{Rt}^{wi}}\right) = \lambda w^{wi} \tag{A.13}$$

Dividing (A.12) by (A.13) yields

$$\frac{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial h_{Rt}^{hu}}\right)}{\left(\frac{\partial U}{\partial R_t}\right)\left(\frac{\partial R_t}{\partial h_{Rt}^{wi}}\right)} = -\left.\frac{dh_{Rt}^{wi}}{dh_{Rt}^{hu}}\right|_{\overline{R_t}} = \frac{w^{hu}}{w^{wi}} \tag{A.14}$$

A.3 Religion in an insurance framework

In Section 2.2.7.2.1 I develop a simple model with uncertainty about the existence of an afterlife. Such a model can also be discussed in an insurance framework where individuals insure themselves against the existence of an afterlife. Durkin and Greeley (1991) present this type of model. Again, I need to make the assumption that there is insecurity about the existence of an afterlife. The following simplifications are introduced: (i) there is only one input – money – in the production of commodities, (ii) income is exogenously determined and does not depend on the consumption choices of the individual, and (iii) there are only two periods: this life and the afterlife.

The individual has an exogenous income y which he or she can use for religious giving m_R and secular spending m_C:

$$y = m_R + m_C \tag{A.15}$$

Religious inputs produce both current religiosity $R_t(m_R)$ and afterlife consumption $R_A(m_R)$, while secular spending produces secular consumption commodities $C(m_C)$. The first derivatives of all commodities with respect to their respective inputs are always positive, the second derivative is negative. I further assume that the utility in a certain state of the world is the sum of the three commodities:

$$U = C(m_C) + R_t(m_R) + R_A(m_R) \tag{A.16}$$

In the insurance model, two states of the world exist: either there is an afterlife or there is not. The individual ascribes a (subjective) probability of $P(A)$ to the former state and a probability of $1 - P(A)$ to the latter. If the afterlife exists, the individual has a payoff

$$U_1 = C(m_C) + R_t(m_R) + R_A(m_R) \tag{A.17}$$

If there is no afterlife, there is no afterlife consumption:

$$U_2 = C(m_C) + R_t(m_R) \tag{A.18}$$

If the individual decides to take out a high afterlife insurance, he or she has to bear costs in the form of foregone secular consumption, but receives high current utility from religiosity, and also afterlife utility[130] with probability $P(A)$. If the individual decides to consume few religious commodities, he or she can use almost all of his or her income for secular consumption, however, in case the afterlife exists, he or she might face hell.[131] In short, the trade-off is between higher secular consumption, but a (possibly) more unpleasant afterlife, and lower secular consumption, while having a more pleasant afterlife.

As in Durkin and Greeley (1991) the individual chooses a level of m_R which maximizes his or her expected utility.

The expected utility is:

[130] It is assumed that afterlife utility is finite. If afterlife utility were infinite, a rational individual would always engage in religious activities, no matter how small the subjective probability that the afterlife exists. This reasoning is known as "Pascal's wager" (see Melkonyan and Pingle, 2009: 4-5, 7).
[131] At least in the Christian tradition a very low (maybe even negative) afterlife utility is connected to the image of hell.

$$EU(m_R) = P(A) * U_1 + \big(1 - P(A)\big) * U_2 \tag{A.19}$$

This equation is differentiated with respect to m_R and set to zero. The result is:

$$\begin{aligned} &\frac{\partial EU}{\partial m_R} \\ &= P(A) * \left[\frac{\partial C}{\partial m_C} * \frac{\partial m_C}{\partial m_R} + \frac{\partial R_t}{\partial m_R} + \frac{\partial R_A}{\partial m_R}\right] + [1 - P(A)] * \left[\frac{\partial C}{\partial m_C} * \frac{\partial m_C}{\partial m_R} + \frac{\partial R_t}{\partial m_R}\right] \\ &= 0 \end{aligned} \tag{A.20}$$

From (A.15) it can easily be seen that $\frac{\partial m_C}{\partial m_R}\Big|_{\overline{U}} = -1$. Rearranging (A.20) yields

$$P(A) * \frac{\partial R_A}{\partial m_R} + \frac{\partial R_t}{\partial m_R} = \frac{\partial C}{\partial m_C} \tag{A.21}$$

These are exactly the same results as in Section 2.2.7.2.1, since (A.21) mirrors (2.50). As resources devoted to religion increase, the marginal utility of current religious consumption decreases and the marginal utility loss from renouncing secular consumption increases. At the same time, the probability-weighted marginal afterlife benefit decreases. With well-behaved utility functions there should be an optimal level of m_R characterized by (A.21). To conclude, individuals with high (marginal) benefits from secular consumption or a low subjective probability of afterlife existence invest little in religion, while people who have high this-worldly or other-worldly religious benefits invest more.

A.4 Religious choice under total ambiguity

Even in the case of total ambiguity individuals must make a decision about religion. Possible decision criteria are: max-max criterion, max-min criterion, Hurwicz criterion, min-max regret criterion and principle of insufficient reason. The discussion that follows is taken from Melkonyan and Pingle (2009: 8-9).

There are two states of the world: the afterlife exists, or it does not. The individual can decide to be religious or to be atheist. The payoff matrix is the same as in Section 2.2.7.2.2 with the additional (reasonable) assumptions

$$I_1^a > I_1^n \tag{A.22}$$

and

$$I_2^a < I_2^n \tag{A.23}$$

Inequality (A.22) says that if the afterlife exists, it is better for the individual to choose to be religious than to be non-religious because afterlife benefits are sufficiently high. However, if the afterlife does not exist, (A.23) says that it preferable not to be religious because the secular costs exceed possible current benefits from religion. This represents a dilemma for the individual, because the best choice depends on which state of the world is true, which is unknown to the individual. (Melkonyan and Pingle, 2009: 8)

If the individual is an optimist, he or she will apply the max-max criterion and choose the alternative which yields that highest utility of all four, hoping that the corresponding state of the world is the true one. If

$$I_1^a > I_2^n \tag{A.24}$$

he or she will choose to be religious and vice versa.

If the individual is a pessimist, he or she might apply the max-min criterion, i.e. the individual tries to avoid the situation with the lowest utility. Comparing the two less fortunate outcomes in each state of the world, the individual will be religious if

$$I_1^n < I_2^a \tag{A.25}$$

and vice versa.

The Hurwicz criterion combines the two previous approaches by weighing the two outcomes of each choice with a optimism parameter.

Applying the min-max regret rule makes the individual choose the alternative where he or she has less to lose. Being religious is chosen if

$$I_1^a - I_1^n > I_2^n - I_2^a \tag{A.26}$$

Finally, the criterion of insufficient reason presumes that in the case of total ambiguity all states of the world are equally likely,

$$P(A) = 1 - P(A) = 0.5 \tag{A.27}$$

With these probabilities given, the individual can then form the expected utility. (Melkonyan and Pingle, 2009: 8-9)

Without knowing the exact utility levels of all alternatives, none of these criteria gives a clear prediction which action to choose. In fact, they might lead to the same or completely different decisions. Which decision criterion is chosen depends, among others, on the degree of optimism or pessimism the individual professes (Melkonyan and Pingle, 2009: 16).

A.5 Extension of the model in Chapter 3

Incorporating the prestige motive in the general model framework of Chapter 3, the utility function of the individual is

$$U = U(m_C, m_R, m_S, D_M) \tag{A.28}$$

where m_C is secular consumption, m_R are voluntary religious contributions, m_S are voluntary contributions to secular charities and D_M is the church membership status.

More specifically, I assume that the utility function is

$$U = {m_C}^{1-\theta_1-\theta_2} * {m_R}^{\theta_1} * {m_S}^{\theta_2} * + D_M * U_{memb} \tag{A.29}$$

where θ_1 and θ_2 are Cobb-Douglas parameters with $0 \leq \theta_1, \theta_2 < 1$ and $\theta_1 + \theta_2 < 1$.

The budget constraint is

$$y - D^{rel} * \tau y - D^{sec} * \tau y = m_C + m_R + m_S \tag{A.30}$$

It is easy to see that this maximization problem equals the problem in the model with intrinsic motivation to give, with the only difference that a and b are always set to zero and the preference parameters β_1 and β_2 are replaced by θ_1 and θ_2. All other properties remain the same, in particular that $D^{rel} = D^{sec} = 0$ in the voluntary giving system; $D^{sec} = 0$ and $D^{rel} = D_M$ in the church tax system and $D^{rel} = 1 - D^{sec}$ in the tax assignment system.

For all individuals in the voluntary giving system and for non-members in the church tax system, giving is independent from the motive to give. The utility for non-members in the church tax system is

$$U_{M_0,pre}^{chur\_tax} = (1 - \theta_1 - \theta_2)^{1-\theta_1-\theta_2} * {\theta_1}^{\theta_1} * {\theta_2}^{\theta_2} * y \tag{A.31}$$

For church members in the church tax system, religious and secular charitable contributions are

$$m_{R,pre} = \theta_1(1 - \tau)y \tag{A.32}$$

$$m_{S,pre} = \theta_2(1-\tau)y \tag{A.33}$$

Total voluntary giving is

$$m_{R,pre} + m_{S,pre} + \tau y = (\theta_1 + \theta_2)y + (1 - \theta_1 - \theta_2)\tau y \tag{A.34}$$

and the utility of members is

$$U_{M_1,pre}^{chur\_tax} = (1-\theta_1-\theta_2)^{1-\theta_1-\theta_2} * {\theta_1}^{\theta_1} * {\theta_2}^{\theta_2} * [1-\tau] * y + U_{memb} \tag{A.35}$$

The Cobb-Douglas-part of the utility is reduced by the factor $[1-\tau]$ for church members in comparison to non-members. This is equivalent to saying that a fraction τ of their income does not create any utility. However, utility is enhanced by adding U_{memb}.

The cut-off level where individuals are indifferent between being and not being a member of the church is

$$y_{pre}^{*} = \frac{U_{memb}}{(1-\theta_1-\theta_2)^{1-\theta_1-\theta_2} * {\theta_1}^{\theta_1} * {\theta_2}^{\theta_2} * \tau} \tag{A.36}$$

Turning the attention now to the tax assignment system, I find that the amount given voluntarily is the same when the church or the state receive the tax, $D^{rel} = 1$ resp. $D^{rel} = 0$. The amount given also equals the amount given by church members in Germany:

$$m_{R,pre} = \theta_1(1-\tau)y \tag{A.37}$$

$$m_{S,pre} = \theta_2(1-\tau)y \tag{A.38}$$

In both cases, total giving is

$$m_{R,pre} + m_{S,pre} + \tau y = (\theta_1 + \theta_2)y + (1 - \theta_1 - \theta_2)\tau y \tag{A.39}$$

and utility is

$$U_{pre}^{ass\_tax} = (1-\theta_1-\theta_2)^{1-\theta_1-\theta_2} * {\theta_1}^{\theta_1} * {\theta_2}^{\theta_2} * [1-\tau] * y + D_M * U_{memb} \tag{A.40}$$

Total giving and utility are the same as for church members in Germany.

Appendix B: Church tax regulations by Land for the years 2001 to 2006

In the following I present the church tax regulations for each Land for the years 2001 to 2006 – the years that my data set comprises. I restrict myself to Catholic and Protestant churches and do not report tax regulations for Jewish communities, the Old Catholic Church *("Altkatholische Kirche")* and Religious Humanist communities *("Freireligiöse Gemeinden")*. The main source of information is the church tax regulations published in the Federal Tax Gazette *("Bundessteuerblatt")*. For some Länder these regulations are not published each year or information on maximum and minimum tax rates is missing. In such cases I refer to information published in Suhrbier-Hahn (1999: 274-282) and Petersen (n.d.: 8, 2006: 22-23), who explain the regulations in 1999, 2002 and 2006, respectively. I also refer to information published on the websites of the regional churches. Information on the current regulations can be found on http://www.steuer-forum-kirche.de/.

I additionally provide information about the state authority that accepts declarations of church disaffiliation. Depending on the Land, this can either be the civil registry office *("Standesamt")* or the district court *("Amtsgericht")*. The data is taken from the church disaffiliation laws of the Länder, which are usually published in the Law and Ordinance Gazettes *("Gesetz- und Verordnungsblatt")* of the Länder. I also provide information about the fees for disaffiliations in each Land. Data is usually taken from the schedule of fees which is published in the Law and Ordinance Gazettes of the Länder.[132]

Note that the church tax rate is reported as a percentage of the income tax liability calculated according to § 51a ITL.

Note that minimum taxes are levied only when the taxpayer has to pay a positive amount of church tax, but the amount falls below the minimum church tax.

Also note that maximum church taxes are reported as a percentage of taxable income. Regulations concerning maximum church taxes vary between Länder and between religious communities within a Land. In some Länder, maximum church taxes are considered *ex officio*, i.e. the tax office considers them in the income and church tax assessment. In these cases, the maximum church tax (if applicable) is the tax reported in the Taxpayer Panel. However, in some Länder the maximum tax is only granted upon request (to be directed to the

[132] The information about the fees for Hamburg was kindly provided by the civil registry office of Hamburg via email.

religious community, not the tax office), either routinely or left to the discretion of the religious community. Tax reductions upon request are not visible in my data set. Nevertheless, in calculating the church tax of each taxpayer I assume that the maximum tax rate is always applied. In addition, note that maximum tax rates, although legally in effect, do not always have consequences in practice. Consider the maximum tax rate of 4 % of taxable income, which is in effect in many Catholic Churches, particular in West Germany. In the years 2001 to 2003, the top income tax rate in Germany was 48.5 %. Applying a church tax rate of 9 % on the income tax rate, the church tax approached 4.365 % of taxable income. Consequently, restricting the church tax to a maximum of 4 % of taxable income had an effect on the church tax liability. However, in 2005 and 2006 the top income tax rate was reduced to 42 %, which implies that the church tax liability approaches a maximum of 3.78 % of taxable income. A maximum tax rate of 4 % of taxable income is without effect.

Baden-Württemberg

Church tax rate: 8 % (all years)

Minimum church tax: 7.20 DM (2001); 3.60 Euro (2002-2006)

Maximum church tax: 3.5 % (Catholic, all years; *Evangelische Landeskirche Baden*, all years; and *Evangelische Landeskirche Württemberg*, 2001-2002); 3 % (*Evangelische Landeskirche Württemberg*, 2003-2004); 2.75 % (*Evangelische Landeskirche Württemberg*, 2005-2006)

NB: From the data set it is not possible to see which of the Protestant churches the taxpayer belongs to. Therefore I apply the average maximum church tax rate of the two Protestant churches to all Protestants in Baden-Württemberg.

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: varies between cities

Bavaria

Church tax rate: 8 % (all years)

Minimum church tax: none (all years)

Maximum church tax: none (all years)

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: 62 DM (2001); 31 Euro (2002-2006)

Berlin

Church tax rate: 9 % (all years)

Minimum church tax: none (all years)

Maximum church tax: 3 % (all years)

State authority responsible for disaffiliation: district court

Fee for declaration of disaffiliation: none (all years)

Brandenburg

Church tax rate: 9 % (all years)

Minimum church tax: none (all years)

Maximum church tax: 3 % (all years)

State authority responsible for disaffiliation: district court

Fee for declaration of disaffiliation: none (all years)

Bremen

Church tax rate: 9 % (all years)

Minimum church tax: none (all years)

Maximum church tax: 3 % (2001-2004); 3.5 % (2005-2006)

State authority responsible for disaffiliation: civil registry office; in addition church disaffiliation has to be declared with the religious community

Fee for declaration of disaffiliation: none (all years)

Hamburg

Church tax rate: 9 % (all years)

Minimum church tax: 7.20 DM (2001); 3.60 Euro (2002-2006)

Maximum church tax: 3 % (all years)

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: 40 DM (2001); 20 Euro (2002-2004); 31 Euro (2005-2006)

Hesse

Church tax rate: 9 % (all years)

Minimum church tax: 3.60 DM (2001); 1.80 Euro (2002-2006)

Maximum church tax: 4 % (Catholic, all years; and Protestant, 2001-2003); 3.75 % (Protestant, 2004; and *Evangelische Kirche von Kurhessen-Waldeck*, 2005); 3.5 % (*Evangelische Kirche von Hessen und Nassau* and *Evangelische Kirche im Rheinland*, 2005; and Protestant, 2006)

NB: From the data set it is not possible to see which of the Protestant churches the taxpayer belongs to. Therefore I apply the average of the maximum church tax rate of the *Evangelische Kirche von Hessen and Nassau* and the *Evangelische Kirche von Kurhessen-Waldeck* in 2005, the only year when maximum church tax rates differ. The *Evangelische Kirche im Rheinland* is not considered, since it covers only a small area in Hesse and regulations coincide with those of the *Evangelische Kirche von Hessen und Nassau*.

State authority responsible for disaffiliation: district court

Fee for declaration of disaffiliation: 40 DM (2001); 20 Euro (2002-2003); 25 Euro (2003-2006)

Lower Saxony

Church tax rate: 9 % (all years)

Minimum church tax: 7.20 DM (2001); 3.60 Euro (2002-2006)

Maximum church tax: 3.5 % (all years)

NB: For the years 2001 to 2004, Protestants and Catholics in Lower Saxony who lived in a region that belonged to the *Bremische Evangelische Kirche* had to pay a maximum church tax of 3 %. In 2005 and 2006, Protestants in Lower Saxony who lived in a region that belonged to the *Nordelbische Evanglisch-Lutherische Kirche* had to pay a maximum church tax of 3 %. Since the *Bremische Evangelische Kirche* and the *Nordelbische Evanglisch-Lutherische Kirche* cover only a small area in Lower Saxony, these exceptions are disregarded.

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: 40 DM (2001); 20.40 Euro (2002); 24 Euro (2002-2006)

Mecklenburg-Western Pomerania

Church tax rate: 9 % (all years)

Minimum church tax: none (2001); 3.60 Euro (2002-2006)

Maximum church tax: none (Protestant, all years; and Catholic, 2001); 3 % (Catholic, 2002-2006)

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: 20 DM (2001); 10 Euro (2002-2006)

North Rhine-Westphalia

Church tax rate: 9 % (all years)

Minimum church tax: none (all years)

Maximum church tax: 4 % (Catholic, all years; and *Evangelische Kirche im Rheinland*, 2001-2003); 3.75 % (*Evangelische Kirche von Westfalen* and *Lippische Landeskirche*, 2001-2004; and *Evangelische Kirche im Rheinland*, 2004); 3.5 % (Protestant, 2005-2006)

NB: From the data set it is not possible to see which of the Protestant churches the taxpayer belongs to. Therefore I apply the average of the maximum church tax rate of the *Evangelische Kirche von Westfalen* and the *Evangelische Kirche im Rheinland* in the years 2001 to 2003 when maximum church tax rates differ. The *Lippische Landeskirche* is not considered, since it covers only a small area in North Rhine-Westphalia and regulations coincide with those of the *Evangelische Kirche von Westfalen*.

State authority responsible for disaffiliation: district court

Fee for declaration of disaffiliation: none (2001-June 2006); 30 Euro (since June 2006)

Rhineland-Palatinate

Church tax rate: 9 % (all years)

Minimum church tax: none (all years)

Maximum church tax: 4 % (Catholic, all years; and Protestant, 2001-2003); 3.75 % (Protestant, 2004); 3.5 % (Protestant, 2005-2006)

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: 40 DM (2001); 20.45 Euro (2002-2006)

Saarland

Church tax rate: 9 % (all years)

Minimum church tax: none (all years)

Maximum church tax: 4 % (Catholic, all years; and Protestant, 2001-2003); 3.75 % (Protestant, 2004); 3.5 % (Protestant, 2005-2006)

State authority responsible for disaffiliation: district court (2001-2003); civil registry office (2004-2006)

Fee for declaration of disaffiliation: 60 DM (2001); 30.70 Euro (2002-2006)

Saxony

Church tax rate: 9 % (all years)

Minimum church tax: 7.20 DM (Protestant, 2001); 3.60 Euro (Protestant, 2002-2006); none (Catholic, all years)

Maximum church tax: 3.5 % (all years)

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: 40 DM (2001); 20.45 Euro (2002-2003); 20 Euro (2004-2006)

Saxony-Anhalt

Church tax rate: 9 % (all years)

Minimum church tax: 7.20 DM (Protestant, 2001); 3.60 Euro (Protestant, 2002-2006); none (Catholic, all years)

Maximum church tax: 3.5 % (all years)

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: 40 DM (2001); 20.45 Euro (2002-2004); 25 Euro (2004-2006)

Schleswig-Holstein

Church tax rate: 9 % (all years)

Minimum church tax: 7.20 DM (2001); 3.60 Euro (2002-2006)

Maximum church tax: 3 % (all years)

State authority responsible for disaffiliation: civil registry office

Fee for declaration of disaffiliation: 20 DM (2001); 10 Euro (2002-2006)

Thuringia

Church tax rate: 9 % (all years)

Minimum church tax: 7.20 DM (Protestant, 2001); 3.60 Euro (Protestant, 2002-2006); none (Catholic, all years)

Maximum church tax: 3.5 % (all years)

State authority responsible for disaffiliation: district court

Fee for declaration of disaffiliation: none (all years)

Appendix C: Calculation of the price of church membership and income

C.1 Calculation of the price of church membership

This section describes in detail the calculation of the price of church membership with the help of the data available in the Taxpayer Panel and discusses limitations of the exact determination of the price. The general procedure is outlined in Section 4.5.4.

C.1.1 Step 1: Calculation of church taxes paid

The first step is the calculation of the deductible amount of church tax. As will soon become obvious, this step is harder to do then the calculation of the actual church tax since relevant data is missing in the data set. The amount paid as church tax during the year is levied either as an additional tax to the payroll tax or together with advance payments on the income tax. Unfortunately the data set only contains the amount of payroll tax paid during the year, but no information on advance payments on the income tax. In addition, the amount of payroll tax cannot simply be taken as a basis for calculating the church tax paid during the year, at least in those cases where the taxpayer has children. The reason is that the child allowance is not taken into account when the payroll tax is determined, but needs to be considered when the amount of church tax due during the year is calculated. Because of these problems, I decided not to use the payroll tax reported as a basis for estimating the church tax paid during the year, but instead use the yearly income reported in the income tax return and calculate the income tax and resulting church tax on that basis. The reasons for this choice are that (i) the income tax appears to be the most accurate available estimate for the payroll tax, and (ii) I have a basis for estimating the church tax paid for individuals who have other types of income than wages.

Church taxes paid during the year are calculated in the following way:

I take the variable c65887 *"zvE unter Berücksichtigung von FB für Kinder und Korrektur durch Halbeinkünfte für WOP/SPZ"* ("taxable income in consideration of child allowances and after correction for half-income"). This variable includes the taxable income for the calculation of the state income tax with the adjustments necessary to arrive at the taxable income for the calculation of church taxes. Those adjustments are established in § 51a ITL ("income tax law" – *"Einkommensteuergesetz"*)[133]. On the one hand the child allowance is

[133] I use the abbreviation ITL for "income tax law" instead of the German *"EStG"* for *"Einkommensteuergesetz"*.

subtracted for every child,[134] on the other hand it is corrected for half-income *("Halbeinkünfte")*. If variable c65887 is missing in the data set, I use variable c65883 *"zvE für Berechnung Kirchensteuer"* ("taxable income for the calculation of the church tax") instead. The two values are virtually always the same.

I need to take into account that for church members the amount of church taxes actually paid during the year is included in the data and deducted from the taxable income in variable c65887. Since my aim is to estimate church taxes paid, I add these deductions again to the taxable income. This procedure also ensures that there are no systematic differences in the deductions considered for the calculation of taxable income between church members and non-members. When adding church taxes paid to the taxable income I also need to take into account the blanket allowance for special expenses, which amounts to 108 DM in 2001 and 36 Euro in the years 2002 to 2006 for the single assessment scheme. This blanket allowance is always deducted for special expenses, even if the actual amount of special expenses is lower. In my calculations I make sure that I always allow for a deduction of special expenses of 108 DM/36 Euro, even if the actual amount of special expenses (less church taxes paid) is lower.

Next, the income tax, which is the basis for the calculation of the church tax, is computed by applying the income tax function to the adjusted taxable income. Some exceptions have to be taken into account here. They refer to individuals who have extraordinary income according to § 34 ITL. There are two different ways to handle extraordinary income outlined in the income tax law, one provision is given in § 34(1) ITL, the other one in § 34(2),(3) ITL.

I start with the case that the taxpayer has income according to § 34(1) ITL. The amount of this type of extraordinary income is given in variable c65549. First, the amount of extraordinary income is subtracted from the adjusted taxable income. The income tax function is then applied to the resulting amount. Second, the same is done again, but this time only 80 % of the extraordinary income is subtracted from the adjusted taxable income. As a result, I receive the income tax (i) if extraordinary income is completely disregarded and (ii) if only 20 % of extraordinary income is included in the taxable income. The income tax is then calculated in the following way: (a) if the taxable income (c65887 resp. c65883, adjusted for church taxes paid, less extraordinary income) is positive, then the income tax on the extraordinary income amounts to five times the difference between the income tax calculated in (ii) and the income tax calculated in (i). This difference is then added to the income tax on regular income from

[134] This is different from the calculation of the state income tax, where the child allowance is only subtracted if it is beneficial for the taxpayer in comparison to receiving child benefits.

(i) in order to receive the final income tax. If (b) extraordinary income exists, but taxable income without extraordinary income is negative, the overall income tax is equal to five times the income tax in case (ii). These rather difficult calculations are motivated by the following reasoning: Income is "extraordinary" when individuals receive it only once, and it is usually quite substantial. In other words, in the year when individuals receive this income, their taxable income would be significantly higher than usual and their marginal tax rate would increase steeply. In order to avoid this, the income is treated as if the individual would receive 20 % of the total amount annually for 5 years.

The law provides a second way of treating extraordinary income in § 34(2),(3) ITL. Preconditions for receiving this kind of treatment are named in the law. The extraordinary income according to § 34(2),(3) ITL is given in variable c65585 (*"Bemessungsgrundlage § 34 Abs. 3 EStG"* – "assessment basis for § 34(3) ITL"). First, I calculate the income tax on adjusted taxable income including extraordinary income and identify the resulting average tax rate by dividing the income tax by the taxable income (including extraordinary income). This tax rate is then multiplied by 0.5 in 2001, 2002 and 2003 and by 0.56 in the years 2004, 2005 and 2006. The resulting percentage is the average tax rate that is applied to the amount of extraordinary income, unless it is below 19.9 % in 2001 and 2002, below 17 % in 2003, below 16 % in 2004 and below 15 % in 2005 and 2006. If this is the case, the higher tax rate applies. The final income tax is the income tax on extraordinary income thus calculated plus the income tax on the "regular" (i.e. not extraordinary) taxable income.

On the income tax thus calculated, either by applying the income tax scale to the taxable income or, if necessary, by taking into account extraordinary income, I apply the church tax regulations.

First, the church tax rate (8 % in Bavaria and Baden-Württemberg, 9 % in all other Länder) is applied to the adjusted income tax due. Second, there is a minimum church tax in some Länder for individuals who have to pay a positive amount of church tax, but less than the minimum amount defined. This tax usually amounts to 3.60 euro per year. For detailed information about church tax rates and minimum church taxes by Land and year see Appendix B.

I take the amount of church tax thus calculated as an estimate for the amount of church taxes paid during the year.

C.1.2 Step 2: Calculation of the church tax

In the second step, I calculate the final amount of church tax. The estimated amount of church tax paid (outcome of step 1) is used as an input variable. For church members, I replace the actual amount of church tax paid (which is reported in the data set) with the estimated amount. For non-members, I include the estimated amount as an additional type of special expenses which reduces their taxable income. The provisions for the blanket allowance for special expenses are again considered.

Then I run calculations similar to those above in order to calculate the church tax. Again, I use the taxable income corrected for child allowances and half-income from variable c65887 resp. c65883. However, instead of assuming that the amount of church taxes paid is zero, I now assume that the amount of church taxes paid is the amount calculated in the first step (both for church members and non-members). I correct the taxable income in variables c65887 resp. c65883 for these deductions.

I then calculate first the income tax and later the church tax from the taxable income thus defined. The steps in the calculation of the church tax are essentially the same as in the calculation above, but with some exceptions. As above, I apply the income tax function of the respective year to the taxable income, and I also take into account extraordinary income. In addition, I incorporate an additional exception in the calculation of income tax, which becomes effective when individuals have income under the "exemption with progression" rule *("Einkommen unter Progressionsvorbehalt")*. Unemployment benefits *("Arbeitslosengeld I")*, parental leave benefits *("Elterngeld")*, sickness benefits *("Krankengeld")* and some further substitutes for earnings named in § 32b(1) ITL as well as foreign income belong to this type of income. They are tax-free, but increase the average tax rate on the remaining income. The income tax is calculated as follows: the taxable income is calculated (i) with and (ii) without including income under the "exemption with progression" rule. The average tax rate for case (i) is identified. This tax rate is then applied to the income in case (ii) in order to arrive at the actual amount of income tax.

The taxable income in case (ii) without income under the "exemption with progression" rule is again the taxable income given in variable c65887 resp. c65883, corrected for the estimated amount of church taxes paid. The taxable income (i) including income under the "exemption with progression" rule has the same basis, but the amount of income under the "exemption with progression" rule (given in variables c66200 to c66205) is added. For this sum, I calculate the income tax according to the income tax function and determine the average tax

rate. The average tax rate is than multiplied with the taxable income (ii) without income under the "exemption with progression" rule in order to arrive at the income tax. I will call this amount of income tax "income tax – regular".

If the individual has extraordinary income and income under the "exemption with progression" rule[135] one has to distinguish between the income tax on "regular" income and on "extraordinary" income. The income tax on regular income is calculated in the way described in the previous paragraph, i.e. it corresponds to "income tax – regular". In addition, one has to take into account the effects of income under the "exemption with progression" rule on the taxation of extraordinary income.

If the individual has extraordinary income according to § 34(1) ITL, the taxable income given in variables c65887 resp. c65883, corrected for the estimated amount of church taxes paid, plus the amount of income under the "exemption with progression" rule, plus 20 % of extraordinary income given in variable c65549 is calculated. Again, I apply the income tax function on the taxable income thus defined, and divide the resulting amount of income tax by the taxable income in order to arrive at the average tax rate. This average tax rate is then applied to taxable income without income under the "exemption with progression" rule (but corrected for church taxes paid and with 20 % of extraordinary income added). I will call the resulting income tax "income tax – extra § 34(1) ITL". The amount of income tax that eventually needs to be paid on extraordinary income is five times the difference between "income tax – extra § 34(1) ITL" and "income tax – regular".

If the individual has extraordinary income according to § 34(2),(3) ITL, the taxable income given in variables c65887 resp. c65883, corrected for the estimated amount of church taxes paid, plus the amount of income under the "exemption with progression" rule, plus the complete amount of extraordinary income given in variable c65585, is calculated. The average tax rate is calculated as in the previous two cases, however, the income tax law defines lower bounds for the average tax rate. The calculation of these minimum tax rates is the same as above in Section C.1.1. Once the appropriate tax rate is identified, the income tax on extraordinary income according to § 34(2),(3) ITL is given by the tax rate multiplied with the total amount of extraordinary income (given in variable c65585).

[135] An example of how the income tax is calculated if both income under the "exemption with progression" rule and extraordinary income according to § 34(1) ITL are present can be found in the income tax guidelines 2003 *("Einkommensteuerrichtlinie 2003")*, R 198.

When the income tax in all cases (with and without income under the "exemption with progression" rule, with and without extraordinary income) is determined, I subtract from the income tax all tax abatements. Tax abatements are calculated as the difference between the collective income tax (*"tarifliche Einkommensteuer"*, variable c65584) and income tax due (*"festzusetzende Einkommensteuer"*, variable c65613). Before I take this difference, I correct the income tax due for the amount of effectively added child benefit (*"tats. hinzuzurechnendes Kindergeld"*, variable c65880). The reason for this is that individuals who choose the child allowance instead of child benefit need to pay back the child benefit they received during the year. This increases the amount of tax they actually have to pay at the end of the year (variable c65613). However, whether someone pays back the child benefit is irrelevant for the calculation of church taxes, therefore the income tax due has to be corrected. Finally, I subtract the tax abatement according to § 35 ITL (*"Ermäßigung nach § 35 EStG"*, variable c65630). This is in accordance with § 51(2) clause 3 ITL which states that this type of tax abatement should not be considered when calculating the church tax.

On the income tax less tax abatements I then apply the church tax regulations. The provisions for the application of church tax rates and the minimum church tax are the same as in the step one (Section C.1.1). Additionally, I take into account the maximum church tax rate which is defined as a percentage of the taxable income (corrected for church taxes paid, including extraordinary income) and is usually between 3 % and 4 % depending on the church tax laws in each Land. The respective percentage is applied to the taxable income. Then I compare the church tax calculated with the usual church tax rate and the church tax calculated with the maximum tax rate and keep the one that is lower. Information about maximum church tax rates can also be found in Appendix B.

There are some differences in the estimation of church taxes paid and the calculation of final church taxes. First, the reason for considering income under the "exemption with progression" rule in the calculation of the final church tax, but not in the estimation of church taxes paid, is that on this type of income individuals do not pay payroll tax and consequently no church tax during the year. In contrast, when calculating the income tax at the end of the year and the final church tax, it is considered. Second, tax abatements only matter in the calculation of the final church tax, but do not matter for payroll taxes and church taxes paid during the year. Third, maximum church tax rates are only applied in the calculation of the final church tax, but not for church taxes paid during the year.

C.1.3 Step 3: Reductions in income tax liability and solidarity surcharge

The church tax so far calculated must not be regarded as the price of church membership. This is because the amount of church taxes paid during the year reduces the taxable income, the income tax liability and the solidarity surcharge. In order to find out how large this reduction in income tax liability and solidarity surcharge is, I calculate the income tax and solidarity surcharge (i) under the assumption that the taxpayer does not pay any church tax during the year (as would be true for non-members) and (ii) under the assumption that the taxpayer does pay church tax and the amount of church taxes paid during the year is equal to the amount estimated above in step one (Section C.1.1). Except for the difference in assumptions, the procedure of the calculation is exactly the same in (i) and (ii). Detailed information about how the income tax and the solidarity surcharge are calculated can be found in Section C.3. The price of church membership is then calculated as lined out in Figure A.1.

Figure A.1: Calculation of the "price of church membership"

	Final church tax
+	Income tax as church member
+	Solidarity surcharge as member
%	Income tax as non-member
%	Solidarity surcharge as non-member
=	"Price of church membership"

C.1.4 Limitations

Both the church tax paid during the year and the final church tax are not calculated exactly. For the church tax paid during the year, this is obvious, since it is based on the payroll tax and advance payments of the income tax, not on the final income tax which I use for calculation. In my own calculations, I basically include all tax exemptions of the individual. In the calculation of the payroll tax, some tax exemptions are always granted, while others have to be requested. Unfortunately, I do not know which ones the individual requested. In addition, the payroll tax is sometimes consolidated into a lump sum. As a consequence, the respective church tax is also paid as a lump sum and therefore not directly dependent on the income tax.

In the calculation of the final church tax there is also some imprecision. First, instead of using the church tax paid during the year as reported in the data set, I use the estimate of church tax paid. Second, in some of the Länder there are different maximum tax rates because the latter are determined by the regional church and there is often more than one regional church in one Land. The data set does not allow identifying which of the regional churches the taxpayer belongs to. Third, in some Länder the maximum tax rate takes effect only when the taxpayer applies for it (if he or she does not, the regular church tax rate is applied). In such cases, I assume that the maximum tax rate is implemented because the church tax with the maximum tax rate in place is the minimum amount of tax the person has to pay in order to be a member and all further payments (including the additional church tax when the person does not apply for the application of the maximum tax rate) can be avoided by the taxpayer. Fourth, some taxpayers move to a different region where different church tax regulations might apply. The church tax is then calculated according to two different church tax regulations proportional to the number of months spent in the two regions during the year. However, I cannot see in the data set when the individual moves, therefore I apply the regulations of the new Land for the whole year. Fifth, there are some additional types of extraordinary income, mainly referring to income from agriculture and forestry, to which specific regulations for the calculation of the income tax apply. Since accounting for them would require an enormous effort in programming, while only a very small number of taxpayers are affected, I disregard them. Sixth, under specific circumstances a (partial) reimbursement of church taxes is possible. The typical case when a reimbursement is granted is when the individual has extraordinary income according to § 34(2) ITL. The decision on reimbursements lies with the churches themselves (Petersen, 2010: 129). Since I have no information about reimbursements granted, they are not included in my estimation of church taxes.

C.2 An alternative calculation for changes in the price of church membership caused by changes in church tax regulations

In Section 4.5.4.2.1 I explain how I split the total change in the price of church membership into changes that are caused by changes in church tax laws and changes with different causes (in particular changes in the income tax laws or individual attributes). However, there are at least two ways to split up changes in price into these two categories. In the method I apply in my research, calculations are based on the income and income tax of the year 2005. The second approach is to take the income and income tax of 2001 and then apply the church tax laws of both 2001 and 2005, calculate the difference between the two amounts of church tax and take this difference as the change in price that is attributed to new church tax regulations.

The change in price that is attributed to the other factors would then be the difference between the church tax amounts under the church tax laws of 2005 attributed to both the income of 2001 and the income of 2005.

The main difference between these two ways of calculation is the classification of changes in the price of church membership that occur because of a simultaneous change in both taxable income and church tax rates. Imagine for a moment that both income and church tax rates increase over time. The change in church taxes can then be separated in three parts: (i) church taxes (calculated with the "old" church tax system) on the additional income, (ii) a higher church tax on the original income, and (iii) a higher church tax on the additional income.[136] In the calculation I use in this chapter, the changes in church tax described in (ii) and (iii) are attributed to the change in church tax rates. With the alternative calculation method the amount in (iii) would be attributed to changes in the income tax law and/or individual characteristics. Individuals should be aware that an increase in taxable income will also increase the amount of church taxes they have to pay. However, the decision for the first calculation method is based on the assumption that when they assess the increase in church tax they probably have in mind the church tax system that they are used to and blame the church tax laws for any differences between the increase in the price of church membership that they expect given the old tax regulations and the actual price they have to pay under the new regulations.

C.3 Calculation of income

Figure 4.1 in Section 4.5.5.2 gives an overview of the calculation of economic income. In the present section I describe each item in more detail and discuss some shortcomings of this definition of economic income.

C.3.1 The aggregate income measure

Ideally I would use as a starting point for my calculations the sum of income *("Summe der Einkünfte")* since it correspond to the "primary market income" (Merz and Zwick, 2001: 517 [my own translation]) and is used by both Merz (2001), Merz and Zwick (2001) and Kalusche (2006) as the relevant income measure. However, since the sum of income is missing for

[136] Consider the following example (for simplicity, assume that the church tax is a linear tax on taxable income): In 2001 the taxable income is 30,000 euro and the tax rate is 5 %. In 2005, the taxable income is 50,000 euro and the tax rate is 10 %. In 2001, the church tax would be 1,500 euro, in 2005 it would be 5,000 euro; the increase is 3,500 euro. This increase can be separated in three parts: (i) the old church tax rate is applied to the additional income, i.e. 5 % on 20,000 euro (= 50,000 euro – 30,000 euro), resulting in an increase in 1,000 euro. (ii), the increase in the church tax rate of 10 %-5 %=5 % is applied to the original income of 30,000 euro, resulting in an increase of 1,500 euro, and (iii), the difference in the church tax rate (5 %) is applied to the additional income (20,000 euro), resulting in an increase of 1,000 euro.

some taxpayers (Bönke, Neher and Schröder, 2007: 592) I start from the overall income *("Gesamtbetrag der Einkünfte")*. According to § 2(3) ITL the difference between the two income measures are the reduction for aged persons (*"Altersentlastungsbetrag"*, variable cc65321), the reduction for single parents (*"Entlastungsbetrag für Alleinerziehende"*, variable c65319) and the reduction for income from farming (variable c65336). By adding these reductions to the overall income, I arrive at the sum of income.

C.3.2 Subtraction of taxes

In the next step, the income tax due and the solidarity surcharge are subtracted from the income because they reduce the income that is available to the individual. Unfortunately, it is not always possible to simply take the income tax due and the solidarity surcharge reported in the data set. The reason is that I want my income measure to be independent of whether the taxpayer is a church member or not, since my dependent variable is the (change in) church membership status, which should not affect the independent variable (in this case, income) in order to avoid endogeneity bias. Therefore I calculate the economic income for church members as if they were no church members. That is, church taxes are assumed not to reduce the economic income and church taxes paid during the year are not counted as special expenses. While for people who do not declare any church taxes paid as special expenses I use the income tax payments and the solidarity surcharge reported in the tax return, I need to re-calculate the income tax and the solidarity surcharge for people who have declared church taxes paid because leaving them out affects the taxable income and thereby the income tax as well as the solidarity surcharge as an additional tax to the income tax. Re-calculating the income tax can be rather complicated if the individual has extraordinary income or income under the "exemption with progression" rule.

No matter which of the following rules for calculating the income tax I apply, the income tax due which I finally use in the calculation of economic income is always corrected for tax abatements. Tax abatements directly reduce the income tax of a taxpayer (not the taxable income). They are calculated as the difference between the collective income tax (*"Tarifliche Einkommensteuer"*, variable c65584) and the income tax due (*"Festzusetzende Einkommensteuer"*, variable c65613).

C.3.2.1 Correction for church taxes paid

When taxpayers report church taxes paid as special expenses, I start by re-calculating the sum of special expenses that is deducted from total income. First, I subtract the church taxes paid from the sum of special expenses. Second, I check if the blanket allowance for special

expenses applies. That is, I use the sum of special expenses less church taxes paid as special expenses if it is larger than 36 euro (in 2001: 55.22 euro). If the sum of special expenses less church taxes paid is lower than 36 (55.22) euro, the re-calculated amount of special expenses is 36 (55.22) euro. Next, I calculate the difference between the original amount of special expenses deducted and the re-calculated amount of special expenses (with church taxes paid set to zero). Then, this difference is added to the taxable income. Eventually, I apply the normal tax scale to the taxable income thus calculated in order to assess the income tax paid. If the taxpayer has neither extraordinary income nor income under the "exemption with progression" rule, the re-calculation of the income tax is completed at this point.

C.3.2.2 Correction for church taxes paid in concomitance with extraordinary income

I separately calculate the income tax for church tax payers who have extraordinary income. For extraordinary income according to § 34(1) ITL I apply the tax function, first, to the income excluding extraordinary income and, second, to the income including 20 % of extraordinary income. Both measures of income are corrected for church taxes paid, as described above. The income tax is then calculated as the income tax on income without extraordinary income plus five times the difference between the tax on income with and without extraordinary income. If the taxable income – including the correction for church taxes paid – is below zero, the income tax is simply five times the income tax on income including 20 % of extraordinary income.

When taxpayers have extraordinary income according to § 34(2),(3) ITL and they report church taxes paid, I first calculate their income tax with and without extraordinary income (again corrected for church taxes paid) and apply the income tax function to both. I then determine the average tax rate by dividing the income tax on income including extraordinary income by the respective amount of income. The relevant tax rate for extraordinary income is then calculated as described in Section C.1.1, i.e. the calculated tax rate is either cut by a fixed percentage, or it is equal to some minimum tax rate. The total amount of taxes is calculated by adding up the income tax on the income without extraordinary income and the income tax on extraordinary income.

In the rare case when taxpayers declare both types of extraordinary income, only the tax on extraordinary income according to § 34(2),(3) ITL is calculated separately and extraordinary income according to § 34(1) ITL is treated as if it was regular income. This is a simplification and can lead to imprecise measurement of taxes paid, however, the case is rare.

C.3.2.3 Corrections for church taxes paid in concomitance with income under the "exemption with progression" rule

Further calculations are necessary when the individual declares church taxes paid and has income under the "exemption with progression" rule. The amount of this type of income is calculated by adding up variables c66200 to c66205. The tax function is then applied to the regular income plus income under the "exemption with progression" rule. I calculate the average tax rate by dividing the resulting income tax by the income including income under the "exemption with progression" rule. Next, I apply this average tax rate to regular income in order to receive the final amount of income tax.

If the taxpayer has both income under the "exemption with progression" rule and extraordinary income according to § 34(1) ITL, I do the following: (i), I calculate the sum of regular taxable income and income under the "exemption with progression" rule and apply the tax function. The resulting average tax rate is then multiplied with regular taxable income only, i.e. taxable income without income under the "exemption with progression" rule. The amount of taxes calculated corresponds to the income tax if income under the "exemption with progression" rule, but no extraordinary income is declared. (ii), in order to quantify the effect of income under the "exemption with progression" rule on extraordinary income, I calculate the sum of regular taxable income, income under the "exemption with progression" rule and 20 % of extraordinary income and apply the tax function again. From the result of this calculation, I derive the average tax rate and apply this to the sum of regular taxable income and 20 % of extraordinary income (i.e. excluding income under the "exemption with progression" rule). The total amount of taxes is now calculated by adding up the result of (i) and five times the difference between the result of (ii) and the result of (i).

The last type of special calculation is for taxpayers who have both income under the "exemption with progression" rule and extraordinary income according to § 34(2),(3) ITL. Here I first calculate the sum of regular taxable income, income under the "exemption with progression" rule and extraordinary income. To this income, I apply the tax function and determine the average tax rate. This tax rate is again reduced by a certain percentage resp. substituted by the minimum tax rate (again, see Section C.1.1). The resulting tax rate is then applied to the amount of extraordinary income, resulting in the tax on extraordinary income. The second part of income taxes is the tax on regular taxable income, which is equal to the tax when income under the "exemption with progression" rule, but no extraordinary income is declared.

In the very rare case that the taxpayer has income under the "exemption with progression" rule and both types of extraordinary income, extra calculations are only done for income under the "exemption with progression" rule and for extraordinary income according to § 34(2),(3) ITL, while the other form of extraordinary income is treated as if it was regular income. This was done in order to limit the programming effort, given that this case is very rare.

C.3.2.4 Corrections for church taxes paid in the calculation of the solidarity surcharge

Apart from the income tax, another type of tax is to be considered since it reduces available income: the solidarity surcharge. The solidarity surcharge is an additional tax to the income tax, therefore the same reasoning as for the income tax applies, i.e. for individuals who do not report church taxes paid as part of their special expenses, the solidarity surcharge reported in the tax data (variable c65975) is used. However, when church taxes paid are reported, I exclude them from the tax deductions, which increases taxable income, income taxes and thereby the tax base of the solidarity surcharge. Unfortunately I cannot use the income tax calculated above as the tax base, since it is not identical with the tax base of the solidarity surcharge. The main difference is the treatment of the child allowance. In the calculation of the income tax, the child allowance is only granted to taxpayers if this is beneficial to them in comparison to receiving child benefit. However, according to § 3(3) SolZG (*"Solidaritätszuschlagsgesetz"* – "Law on Solidarity Surcharge") the child allowance is granted to all taxpayers with children when calculating the solidarity surcharge.

I calculate the solidarity surcharge as follows: (i), if the taxpayer uses the child allowance in the calculation of taxable income for the income tax, I simply use the taxable income corrected for church taxes paid (as described in Section C.3.2.1) as the tax base. (ii), if the individual does not utilize the child allowance, I also use the taxable income corrected for church taxes paid, but subtract the child allowance that the taxpayer is entitled to (*"Summe der KFB nach § 51 a EStG"*, variable c66998)[137]. (iii), if the individual has income under the "exemption with progression" rule, I apply (i) resp. (ii), but in each case add the reported income under the "exemption with progression" rule. Then I apply the tax function on the income thus calculated. In cases (i) and (ii), the result of these calculations is the collective income tax *("tarifliche Einkommensteuer")*. In case (iii), i.e. when the taxpayer has income under the "exemption with progression" rule, I first determine the average tax rate by dividing the income tax calculated by the income including income under the "exemption with

[137] If the taxpayer does not have children, variable c66998 is equal to zero.

progression" rule. Then I apply the average tax rate to the income without income under the "exemption with progression" rule (but corrected for the child allowance). The result is again the collective income tax. If the individual has extraordinary income (and either of the cases (i), (ii) or (iii) applies) I simply use the income tax on extraordinary income from the calculations above (see Section C.3.2.2) and add this to the collective income tax from calculations (i), (ii) or (iii).[138]

The tax base for the calculation of the solidarity surcharge is then the collective income tax described in the previous paragraph minus all tax reliefs. Tax reliefs are calculated as the difference between the collective income tax reported in the data set (variable c65584) and the income tax due (*"festgesetzte Einkommensteuer"*, variable c65613), corrected for child benefit payments. Finally, I apply the tax scale laid out in § 4 and § 3(3) SolZG.

C.3.3 Child benefit

I also calculate the child benefit the taxpayer receives since it is not directly reported in the data set. I use the "sum of child allowances" (variable c66998) and divide it by the monthly child allowance. This gives the number of children-months[139] for which the individual received child benefit. The amount of child benefit varies according to the number of children. I make the assumption that the individual receives the child benefit for the first child (154 euro from 2002 until 2006) for the first 12 children-months, child benefit for the second child for any additional months up to 24 children-months and so on. It should be noted that being granted a child allowance does not require that the children live in the taxpayer's household and it may well be the case that the child benefit is paid out to the other parent. If the individual utilizes the child allowance (i.e. variable c65879 is greater than zero) in the calculation of the income tax instead of receiving child benefit, then child benefit is zero in my calculation.

C.3.4 Pensions

Pensions need to be calculated because only a (minor) part of income from pensions is taxable, while the (usually larger) share of pensions is tax-exempt. This has two implications: first, the majority of pensioners are not included in the data set since their taxable pension

[138] This calculation is not entirely correct for individuals with children. However, the total amount of solidarity surcharge is small in comparison to the income, and the problem only arises for a small number of taxpayers who have extraordinary income, children and do not use the child allowance. The size of the problem is further reduced since people who have a high extraordinary income will probably utilize the child allowance. If they do not use the child allowance, extraordinary income is not exceptionally high and therefore the miscalculation in the solidarity surcharge is negligible.

[139] If the taxpayer has more than one child, this number can be greater than 12.

income does not exceed the basic personal allowance *("Grundfreibetrag")*; second, the actual income of pensioners in the data set is underestimated if only their taxable income is considered. Therefore I calculate the amount of income from pensions that is tax-free and add it to the taxable income.

The determination of the tax-free amount of pensions changed beginning in 2005. I start by describing the calculations for the years 2001 to 2004. There are several variables in the data set that refer to pensions. The largest share of pension payments is reported in variable c65263 *("Besteuerungsanteil aller Renten nach § 22 Nr. 1+5 außer § 52 Abs. 34c EStG –A– ")*. If the individual receives more than one pension, variables c65265 *("Ertragsanteil 2. Renten –A–")*, c65267 *("Ertragsanteil weitere Rente (1) –A–")* and c65269 *("Steuerpflichtiger Teil der Rente f. mehrere Jahre –A–")* enter the picture. All these variables report only the taxable part of pensions. Which share of the pension is taxable depends on the age of the taxpayer when he or she first received the pension payment. That share is reported in variables c55052 *("Ertragsanteil Leibrenten, 1. Rente –A–")* and c55056 *("Ertragsanteil Leibrenten, 2. Rente –A–")*. With the help of the taxable amount of pensions and the percentage that is taxable I calculate the tax-free amount.[140] I apply the percentage reported in variable c55052 to the pension reported in variables c65263 and c65269. The percentage in variable c55056 is matched with the pension in variable c65265. Unfortunately there is no percentage given for the additional pensions in variable c65267, therefore I assume an average share of taxable pension income of 30 %. This share is taken from Kalusche (2006: 52).

In 2005, the taxation of pensions changed. In that year 50 % of the pension income was taxable. In 2006, the same amount of pensions as in 2005 was tax-exempt, while the rest (including possible increases in pensions) was taxable. For individuals receiving a pension for the first time in 2006, 52 % were taxable and 48 % were tax-exempt. I simplify the calculation and assume that the tax-exempt amount is as large as the taxable amount, both in 2005 and 2006. This induces some errors for the year 2006, since the tax-exempt share of the pension is slightly over-estimated for those who receive a pension for the first time in 2006 and under-estimated for those experiencing a rise in pension payments in 2006. However, the error should be small here because there was no increase in pensions from the public pension system in 2006. The reporting of pension payments in the data set also changed in 2005. All pensions are reported in variable c65263, while variables c65265 and c65267 are missing.

[140] For the year 2001 there appears to be an error in the data. Obviously the percentages reported in variables c55052 and c55056 were divided by the conversion factor between euro and DM. I corrected for this error.

Sometimes pensions are also reported as recurring payments in variable c65271 *("Einkünfte wiederkehrende Bezüge –A–")*. Therefore I use the amounts reported in this variable if c65263 is zero. However, since income from alimony payments (*"Einnahmen aus Unterhaltsleistungen –A–"*, variable c65273) also count as recurring payments, I subtract them first.[141]

C.3.5 Tax-exempt capital gains, allowable deductions, income-related expenses

In accordance with Merz (2001), Merz and Zwick (2001) and Kalusche (2006) I add tax-exempt capital gains *("steuerfrei bleibende Veräußerungsgewinne")* from agriculture and forestry (variable c65112), business (variable c65127) and self-employment (variable c65149). Furthermore, I add allowable deductions. These include an allowable deduction for income from agriculture and forestry (*"Freibetrag nach § 14a Abs. 4 EStG"*, variable c65110), a deduction for pensions of civil servants (*"Freibeträge für Versorgungsbezüge"*, variable c65167), the savings allowance (*"Sparerfreibetrag"*, variable c65227), as well as two types of allowable deductions for other income (*"Versorgungs-FB bein Einn. i.S.d. § 52 Abs. 34c S. 1 EStG"*, variable c65289, and *"Versorgungs-FB zu Abgeordnetenbezügen"*, variable c65295).[142] My calculations differ from Merz (2001), Merz and Zwick (2001) and Kalusche (2006) in that I allow income-related expenses *("Werbungskosten")* to reduce the income, while the other authors count them as part of the income. My reason for subtracting income-related expenses from the income is that according to the definition in § 9 ITL they are "expenditures for the acquisition, safeguarding and maintenance of income" (my own translation), which makes them necessary expenditures of the individual that are not available for consumption or saving.

C.3.6 Extraordinary financial burdens, alimony, transfer income

Following Merz (2001), Merz and Zwick (2001) and Kalusche (2006) I subtract some extraordinary financial burdens (*"außergewöhnliche Belastungen"*, variables c65469, c65472 and c65475) as well as alimony to a separated or divorced partner (*"Unterhaltsleistungen nach § 10 Abs. 1 Nr. 1 EStG"*, variable c65401). A valid measure of economic income would also include transfer income. Unfortunately, only few types of transfer income are included in the data set. Apart from child benefits, which are discussed in Section C.3.3, I include the employee's savings premium *("Arbeitnehmersparzulage")* and the pensions-savings grant *("Altersvorsorgezulage")*.

[141] Kalusche (2006: 52) also reports that recurring payments are the sum of pensions and alimony payments.
[142] These two types of allowable deductions are neither mentioned in Merz (2001), Merz and Zwick (2001) nor in Kalusche (2006). However, I simply decided to treat them in the same way as the other allowable deductions.

The employee's savings premium (*"Festgesetze SPZ"*, variable c66515)[143] is a transfer paid by the state to employees who receive employment benefits to encourage capital formation *("vermögenswirksame Leistungen")*, i.e. an additional payment by the employer that must be used for building up private capital over a long period of time. Obviously the economic income should also include the amount of employment benefits to encourage capital formation paid by the employer.[144] However, this data is only available for 2001 and 2002. Therefore I decided to exclude it completely from the calculation of income since I want to avoid fluctuations in the economic income that are caused by missing data.

Finally, I add the pensions-savings grant (*"Altersvorsorgezulage"*, variable c65895) to the economic income. This is a transfer payment for individuals who pay into a private pension insurance. The pensions-savings grant is not mentioned by Merz (2001), Merz and Zwick (2001) and Kalusche (2006) since it was only introduced in 2002 and the authors work with older data. However, I could not find an argument against including this new type of transfer payment.

C.3.7 Half-income

Interest in corporations are only 50 % taxable according to § 3(40) ITL (so-called "half-income" – *"Halbeinkünfte"*). In order to calculate the complete income of the taxpayer I add the tax-exempt half of these incomes. They are given in variable c65883 *("Hinzurechnungsbetrag stfr. Halbeinkünfte")*.

C.3.8 Problems and shortcomings of the definition of economic income

In my own definition of income I try to stay as close to the data given in the Taxpayer Panel as possible and avoid estimations with average values. The most severe consequence is that my definition of economic income does not account for social security contributions paid because they are not included in the Taxpayer Panel. Merz (2001), Merz and Zwick (2001) and Kalusche (2006) calculate social security contributions on the basis of the income data given.

Another difference between my definition and those by Merz and Kalusche is that the two authors account for tax concessions for businesses and for earners of income from rent and leasing. The authors argue that businesses have a lot of opportunities to reduce their actual

[143] The values of variable c66515 are negative, although the employee's savings premium increases income. Therefore in my calculation of income the variable is subtracted.
[144] Kalusche (2006) includes neither employee's savings premium nor employment benefits to encourage capital formation in his definition of income since he lacks data on both. In contrast, Merz (2001) and Merz and Zwick (2001) include both.

income (Merz, 2001: 30-31), with different kinds of depreciations as just one example. Some of these tax concessions are reported in an attachment to the tax declaration *("Anlage St")*. Unfortunately, this data is completely lacking in the data set available to me. Therefore I underestimate the economic income of individuals who have business income or income from rent and leasing. However, this is mainly relevant for high-income individuals (Merz, 2001: 29) who are partly excluded from my study since I do not have information about their federal state of residence (see Section 4.5.2).

Apart from the data given in the attachment *"Anlage St"*, Merz (2001), Merz and Zwick (2001) and Kalusche (2006) include some minor corrections of the income from agriculture and forestry and from trade or business. As to the former, some small enterprises in agriculture and forestry are allowed to calculate their profit with a simplified method, which – according to Merz and Zwick (2001, footnote 19) – leads to an underreporting of profits. Merz and Zwick (2001: 517) assume an average reporting of profits of 60 % and correct the income accordingly. I do not do this here in order to be consistent with not accounting for tax concessions and because I lack current data on the extent of underreporting. In addition, taxpayers who benefit from this simplified method of profit calculation have on average a quite small amount of income from agriculture and forestry (Bayerischer Oberster Rechnungshof, 2012: 63). Concerning income from participating interest (*"Einkünfte aus Beteiligungen"*, variable c65125) I simply take the value reported in the data set while Merz (2001), Merz and Zwick (2001) and Kalusche (2006) only include the value if it is positive. Merz and Zwick (2001: 517) argue that this type of income is often used for tax planning. In order to be consistent with the above and since I do not have any information which of the losses are real reductions in income and which are due to tax planning, I do not follow Merz and Zwick (2001) here.

Appendix D: Additional results for Chapter 4

D.1 Summary statistics

Table A.1: Summary statistics for the subsamples of West Germany and East Germany separately

	Subsample West Germany		**Subsample East Germany**	
	Mean	**std. dev.**	**mean**	**std. dev.**
Church disaffiliation	0.091	0.288	0.141	0.348
Price of church membership				
Price 2001 (in 100€)	1.87	22.51	1.27	14.32
Dummy Price 2001 positive	0.710	0.454	0.617	0.486
Δ Price (in 100€)	0.50	23.69	0.45	14.95
Dummy Price increase	0.526	0.499	0.488	0.500
Δ Price positive (in 100€)	1.81	26.90	1.71	18.95
Δ Price negative (in 100€)	-0.95	17.83	-0.75	9.42
Income				
Income 2001 (in 1,000€)	21.456	84.949	17.220	60.562
Δ Income (in 1,000€)	1.802	117.414	1.762	59.595
Age				
Below 25	0.195	0.396	0.168	0.374
25 to 34	0.255	0.436	0.280	0.449
35 to 44	0.218	0.413	0.244	0.430
45 to 54	0.138	0.345	0.162	0.369
55 to 64	0.081	0.274	0.081	0.273
65 and above	0.113	0.316	0.064	0.245
Gender				
Male	0.507	0.500	0.513	0.500
Female	0.493	0.500	0.487	0.500
Children				
No children	0.836	0.371	0.695	0.460
Parent, no change	0.100	0.299	0.167	0.373
Became parent	0.021	0.143	0.059	0.235
More children	0.006	0.076	0.017	0.128

Fewer children	0.013	0.113	0.023	0.149
No longer have children	0.025	0.156	0.039	0.195
*Interaction Gender*Children*				
No children	0.816	0.388	0.652	0.476
Parent, no change	0.118	0.323	0.204	0.403
Became parent	0.015	0.121	0.050	0.218
More children	0.004	0.065	0.016	0.127
Fewer children	0.016	0.126	0.029	0.168
No longer have children	0.031	0.173	0.049	0.216
Main source of income				
Wage	0.781	0.413	0.750	0.433
Agriculture and forestry	0.008	0.092	0.005	0.070
Business activity	0.078	0.268	0.117	0.321
Capital	0.041	0.198	0.027	0.161
Other	0.091	0.288	0.102	0.303
Denomination				
Protestant	0.453	0.498	0.795	0.404
Catholic	0.547	0.498	0.205	0.404
Land				
North Rhine-Westphalia	0.274	0.446		
Baden-Württemberg	0.165	0.371		
Bavaria	0.246	0.430		
Bremen	0.007	0.081		
Hamburg	0.011	0.103		
Hesse	0.094	0.291		
Lower Saxony	0.096	0.295		
Rhineland-Palatinate	0.062	0.241		
Saarland	0.016	0.127		
Schleswig-Holstein	0.030	0.169		
Berlin			0.313	0.464
Brandenburg			0.110	0.313
Mecklenburg-W. Pomerania			0.069	0.253

Saxony			0.247	0.431
Saxony-Anhalt			0.085	0.279
Thuringia			0.175	0.380
Mobility				
No mobility	0.957	0.203	0.956	0.205
West-West	0.034	0.181		
West-East	0.009	0.095		
East-East			0.010	0.099
East-West			0.034	0.181
Sample size	144,675		20,471	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Data is weighted with sample weights provided by the Federal Statistical Office. Areas shaded in grey refer to variables that are not available for the particular subsample.

Table A.2: Summary statistics for the subsamples of Protestants and Catholics separately

	Subsample Protestants		**Subsample Catholics**	
	Mean	**std. dev.**	**mean**	**std. dev.**
Church disaffiliation	0.112	0.316	0.078	0.269
Price of church membership				
Price 2001 (in 100€)	1.83	20.19	1.83	23.21
Dummy Price 2001 positive	0.707	0.455	0.701	0.458
Δ Price (in 100€)	0.44	20.42	0.57	25.14
Dummy Price increase	0.506	0.500	0.540	0.498
Δ Price positive (in 100€)	1.77	24.75	1.83	27.48
Δ Price negative (in 100€)	-0.93	13.34	-0.93	20.34
Income				
Income 2001 (in 1,000€)	21.196	79.031	21.146	86.166
Δ Income (in 1,000€)	1.595	79.340	1.985	139.182
Age				
Below 25	0.176	0.380	0.210	0.407
25 to 34	0.256	0.436	0.257	0.437
35 to 44	0.217	0.412	0.223	0.416
45 to 54	0.143	0.350	0.136	0.343
55 to 64	0.086	0.281	0.077	0.267
65 and above	0.123	0.328	0.097	0.297
Gender				
Male	0.489	0.500	0.525	0.499
Female	0.511	0.500	0.475	0.499
Children				
No children	0.814	0.389	0.837	0.369
Parent, no change	0.111	0.315	0.098	0.297
Became parent	0.025	0.157	0.022	0.147
More children	0.007	0.082	0.006	0.078
Fewer children	0.014	0.119	0.013	0.113
No longer have children	0.029	0.167	0.024	0.152
*Interaction Gender*Children*				
No children	0.791	0.407	0.819	0.385
Parent, no change	0.132	0.339	0.116	0.320
Became parent	0.019	0.136	0.015	0.123

More children	0.005	0.074	0.005	0.068
Fewer children	0.018	0.134	0.016	0.125
No longer have children	0.034	0.182	0.030	0.169
Main source of income				
Wage	0.768	0.422	0.789	0.408
Agriculture and forestry	0.008	0.091	0.008	0.090
Business activity	0.082	0.275	0.079	0.270
Capital	0.042	0.202	0.038	0.190
Other	0.099	0.299	0.086	0.280
Land				
North Rhine-Westphalia	0.211	0.408	0.296	0.457
Baden-Württemberg	0.162	0.368	0.146	0.353
Bavaria	0.124	0.329	0.325	0.468
Bremen	0.011	0.103	0.002	0.045
Hamburg	0.017	0.130	0.003	0.057
Hesse	0.113	0.316	0.064	0.245
Lower Saxony	0.140	0.347	0.044	0.205
Rhineland-Palatinate	0.049	0.216	0.066	0.248
Saarland	0.007	0.085	0.023	0.148
Schleswig-Holstein	0.053	0.224	0.004	0.066
Berlin	0.032	0.177	0.011	0.104
Brandenburg	0.014	0.115	0.002	0.044
Mecklenburg-W. Pomerania	0.008	0.091	0.001	0.037
Saxony	0.030	0.172	0.004	0.065
Saxony-Anhalt	0.010	0.098	0.002	0.047
Thuringia	0.019	0.135	0.006	0.076
Mobility				
No mobility	0.954	0.209	0.960	0.197
West-West	0.032	0.176	0.031	0.174
West-East	0.009	0.095	0.008	0.089
East-East	0.001	0.032	0.0003	0.018
East-West	0.004	0.060	0.001	0.033
Sample size	86,575		78,571	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Data is weighted with sample weights provided by the Federal Statistical Office.

D.2 Additional results for the complete sample

Table A.3: Estimation results for the complete sample, and for the subsamples of males and females separately

	Complete sample		**Subsample males**		**Subsample females**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Intercept	**-2.072**	2535.800 (0.000)	**-1.992**	1458.320 (0.000)	**-2.171**	1277.956 (0.000)
Price						
Price 2001	**0.059**	125.619 (0.000)	**0.059**	69.621 (0.000)	**0.061**	55.615 (0.000)
Dummy Price 2001 positive	0.022	0.5388 (0.463)	-0.023	0.322 (0.571)	0.079	3.134 (0.077)
Δ Price	**0.055**	164.905 (0.000)	**0.053**	92.799 (0.000)	**0.060**	67.069 (0.000)
Income						
Income 2001	-0.000	0.0261 (0.872)	-0.001	0.253 (0.615)	0.001	0.126 (0.723)
Δ Income	**-0.002**	8.334 (0.004)	-0.003	6.500 (0.011)	-0.002	1.692 (0.193)
Age						
Below 25	*reference*	---	*reference*	---	*reference*	---
25 to 34	0.049	2.459 (0.117)	0.056	1.910 (0.167)	0.042	0.721 (0.396)
35 to 44	**-0.361**	99.527 (0.000)	**-0.395**	70.363 (0.000)	**-0.307**	29.363 (0.000)
45 to 54	**-0.857**	368.981 (0.000)	**-0.941**	231.648 (0.000)	**-0.772**	140.876 (0.000)
55 to 64	**-1.527**	572.462 (0.000)	**-1.674**	303.089 (0.000)	**-1.415**	262.806 (0.000)
65 and above	**-2.588**	991.511 (0.000)	**-2.531**	248.244 (0.000)	**-2.573**	653.652 (0.000)
Gender						
Male	*reference*	---				
Female	0.020	0.646 (0.422)				
Children						
No children	*reference*	---	*reference*	---	*reference*	---
Parent, no change	**0.1881**	12.606 (0.000)	**0.219**	16.314 (0.000)	**-0.291**	23.987 (0.000)

Became parent	-0.072	0.850 (0.357)	-0.068	0.749 (0.387)	-0.217	4.180 (0.041)
More children	-0.382	4.408 (0.036)	-0.370	4.075 (0.044)	**-0.991**	10.693 (0.001)
Fewer children	0.083	0.251 (0.616)	0.141	0.711 (0.399)	-0.100	0.465 (0.495)
No longer have children	**0.299**	8.244 (0.004)	**0.348**	10.855 (0.001)	**0.321**	11.466 (0.001)
*Interaction Gender*Children*						
No children	*reference*	---				
Parent, no change	**-0.460**	36.799 (0.000)				
Became parent	-0.161	1.510 (0.219)				
More children	-0.605	2.938 (0.087)				
Fewer children	-0.143	0.429 (0.512)				
No longer have children	0.073	0.279 (0.597)				
Main source of income						
Wage	*reference*	---	*reference*	---	*reference*	---
Agriculture and forestry	**-1.866**	87.249 (0.000)	**-2.050**	112.402 (0.000)	-0.771	1.868 (0.172)
Business activity	**0.220**	57.466 (0.000)	**0.196**	29.669 (0.000)	**0.262**	27.211 (0.000)
Capital	**-0.214**	11.754 (0.001)	**-0.241**	7.670 (0.006)	-0.197	4.822 (0.028)
Other	-0.074	1.982 (0.159)	-0.060	0.651 (0.420)	-0.093	1.543 (0.214)
Denomination						
Protestant	*reference*	---	*reference*	---	*reference*	---
Catholic	**-0.357**	220.105 (0.000)	**-0.401**	160.926 (0.000)	**-0.297**	64.017 (0.000)
Land						
North Rhine-Westphalia	*reference*	---	*reference*	---	*reference*	---
Baden-Württemberg	**-0.160**	17.257 (0.000)	-0.079	2.456 (0.117)	**-0.277**	20.849 (0.000)

Bavaria	-0.082	5.715 (0.017)	**-0.138**	8.970 (0.003)	-0.006	0.015 (0.902)
Bremen	**0.725**	125.448 (0.000)	**0.736**	67.026 (0.000)	**0.717**	58.689 (0.000)
Hamburg	**1.013**	289.150 (0.000)	**1.068**	166.642 (0.000)	**0.965**	125.965 (0.000)
Hesse	0.102	5.609 (0.018)	0.062	1.177 (0.278)	0.156	5.640 (0.018)
Lower Saxony	0.068	2.410 (0.121)	0.037	0.396 (0.529)	0.114	2.885 (0.089)
Rhineland-Palatinate	**-0.203**	14.958 (0.000)	-0.134	4.057 (0.044)	**-0.312**	13.111 (0.000)
Saarland	**-0.323**	19.538 (0.000)	**-0.301**	10.329 (0.001)	**-0.345**	8.803 (0.003)
Schleswig-Holstein	**0.305**	27.928 (0.000)	**0.389**	28.353 (0.000)	0.198	4.385 (0.036)
Berlin	**1.256**	651.065 (0.000)	**1.344**	384.555 (0.000)	**1.175**	268.604 (0.000)
Brandenburg	0.099	1.020 (0.313)	0.017	0.017 (0.895)	0.207	1.803 (0.179)
Mecklenburg-W. Pomerania	0.141	1.706 (0.192)	0.050	0.149 (0.700)	0.236	2.204 (0.138)
Saxony	0.147	4.270 (0.039)	0.074	0.610 (0.435)	0.252	5.460 (0.020)
Saxony-Anhalt	**0.285**	8.471 (0.004)	0.245	3.580 (0.059)	0.342	5.189 (0.023)
Thuringia	**-0.399**	21.583 (0.000)	**-0.476**	18.206 (0.000)	-0.283	4.342 (0.037)
Mobility						
No mobility	*reference*	---	*reference*	---	*reference*	---
West-West	**1.461**	1208.793 (0.000)	**1.447**	677.611 (0.000)	**1.484**	528.827 (0.000)
West-East	**3.505**	1676.500 (0.000)	**3.487**	983.255 (0.000)	**3.533**	689.637 (0.000)
East-East	**2.454**	115.804 (0.000)	**2.542**	71.311 (0.000)	**2.356**	45.726 (0.000)
East-West	**0.919**	55.246 (0.000)	**1.036**	38.019 (0.000)	**0.814**	20.139 (0.000)

Sample size	165,146		85,779		79,367	
-2 Log L (constant only)	2,769,469		1,513,861		1,249,272	
-2 Log L (constant and covariates)	2,426,852		1,346,487		1,077,929	
Likelihood-Ratio χ^2	342,617 (53 df)		167,374 (41 df)		171,343 (41 df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Areas shaded in grey refer to variables that are not included in the estimation for the particular subsample. Bold coefficients are significant at the 1 percent level.

Table A.4: Estimation results for the complete sample with different definitions of the variables measuring church tax and income

	Complete sample		**Complete sample**	
	Model 2a		**Model 2d**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Church tax				
Church tax 2001	**0.033**	179.602 (0.000)	**0.017**	24.349 (0.000)
Dummy Church tax 2001 positive	0.056	3.931 (0.047)	**0.132**	21.815 (0.000)
Δ Church tax	**0.026**	145.229 (0.000)		
Dummy Church tax increase			**0.086**	11.602 (0.001)
Δ Church tax positive			**0.042**	268.215 (0.000)
Δ Church tax negative			**-0.012**	9.027 (0.003)
Income				
Income 2001	-0.001	1.539 (0.215)	**-0.003**	10.079 (0.002)
Δ Income	-0.002	4.641 (0.031)	**-0.003**	9.776 (0.002)
Sample size	165,146		165,146	
-2 Log L (constant only)	2,769,469		2,769,469	
-2 Log L (constant and covariates)	2,426,806		2,422,328	
Likelihood-Ratio χ^2	342,663 (53 df)		347,141 (55df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: All estimations include intercept, gender dummy, dummy for children, interaction of gender and children, denomination, regional dummies, mobility and main source of income. Areas shaded in grey refer to variables that are not included in the estimation for the particular model. Bold coefficients are significant at the 1 percent level.

Table A.4 shows the estimation results when the amount of church tax instead of the price of church membership is used as an independent variable for estimating the probability of church disaffiliation. Model 2a (2d) in Table A.4 mirrors model 1a (1d) in Table 4.3 in Section 4.7.1. The results based on the church tax are substantially the same as those for the price of church membership. Both the amount of church tax paid in 2001 *("Church tax 2001")* and the change in church tax between 2001 and 2005 *("Δ Church tax")* significantly increase the

probability of disaffiliation. The estimated coefficients for the church tax variables are somewhat smaller than for the price variables. Part of this difference can be explained by the fact that an individual's price of church membership is usually lower than the amount of church tax paid, or in other words a change in church tax by 100 euro coincides with a change in price by less than 100 euro. Looking at model 2d, I find that an increase in church taxes has a larger effect on the probability of leaving the church than a decrease in church taxes. However, I do find that even a decrease in church taxes can raise the probability of disaffiliation.[145] This stands in contrast to the results of the estimation including the price of church membership (model 1d in Table 4.3), where a decrease in the price of membership does not have a significant influence on the probability of disaffiliation. Nevertheless, the estimated effect of a positive change in church taxes is much larger than that of a negative change and also has a considerably larger p-value, therefore the basic conclusion from Section 4.7.1 that increases and decreases in price resp. church tax have asymmetric effects on the probability of disaffiliation is unchanged.

[145] The estimate of the variable *"Δ Church tax negative"* has a negative sign, however, the change in church tax is also negative. Multiplying these two numbers results in a positive sign, i.e. an increase in the probability of disaffiliation.

Table A.5: Estimation results for the complete sample for two-year periods

	Complete sample (all disaffiliations)		**Disaffiliation 2002**		**Disaffiliation 2003**		**Disaffiliation 2004**		**Disaffiliation 2005**	
	Model 1a		**Model 1a**		**Model 1a**		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Intercept	**-2.072**	2535.800 (0.000)	**-3.392**	2106.494 (0.000)	**-3.366**	1854.472 (0.000)	**-3.205**	1332.815 (0.000)	**-3.116**	1101.007 (0.000)
Price of church membership										
Price	**0.059**	125.619 (0.000)	**0.052**	50.195 (0.000)	**0.059**	85.699 (0.000)	**0.056**	73.283 (0.000)	**0.022**	9.821 (0.002)
Dummy Price positive	0.022	0.5388 (0.463)	-0.061	1.207 (0.272)	0.021	0.129 (0.719)	**-0.179**	7.838 (0.005)	**-0.268**	15.274 (0.000)
Δ Price	**0.055**	164.905 (0.000)	**0.045**	43.901 (0.000)	**0.040**	35.119 (0.000)	**0.029**	32.409 (0.000)	**0.022**	14.516 (0.000)
Income										
Income	-0.000	0.0261 (0.872)	0.000	0.017 (0.898)	-0.001	6.025 (0.014)	**-0.002**	10.909 (0.001)	0.000	0.061 (0.805)
Δ Income	**-0.002**	8.334 (0.004)	0.000	0.105 (0.746)	-0.001	2.012 (0.156)	**-0.000**	17.156 (0.000)	**-0.001**	6.677 (0.010)
Age										
Below 25	*reference*	---	*reference*	---	*reference*	---	*reference*	---	*reference*	---
25 to 34	0.049	2.459 (0.117)	-0.076	1.729 (0.189)	-0.116	4.077 (0.044)	**-0.198**	9.467 (0.002)	**-0.199**	8.304 (0.004)
35 to 44	**-0.361**	99.527 (0.000)	**-0.415**	38.339 (0.000)	**-0.517**	62.227 (0.000)	**-0.549**	60.318 (0.000)	**-0.795**	105.038 (0.000)

45 to 54	**-0.857**	368.981 (0.000)	**-0.848**	100.303 (0.000)	**-0.968**	146.240 (0.000)	**-1.062**	153.880 (0.000)	**-1.116**	160.501 (0.000)
55 to 64	**-1.527**	572.462 (0.000)	**-1.571**	139.018 (0.000)	**-1.735**	210.594 (0.000)	**-1.667**	195.576 (0.000)	**-1.754**	208.271 (0.000)
65 and above	**-2.588**	991.511 (0.000)	**-2.684**	223.379 (0.000)	**-3.109**	352.905 (0.000)	**-2.185**	278.460 (0.000)	**-3.153**	458.154 (0.000)
Gender										
Male	*reference*	---	*reference*	---	*reference*	---	*reference*	---	*reference*	---
Female	0.020	0.646 (0.422)	-0.019	0.156 (0.693)	0.038	0.687 (0.407)	0.008	0.025 (0.874)	0.115	5.219 (0.022)
Children										
No children	*reference*	---	*reference*	---	*reference*	---	*reference*	---	*reference*	---
Parent, no change	**0.1881**	12.606 (0.000)	-0.046	0.252 (0.615)	0.069	0.630 (0.427)	0.168	3.626 (0.057)	-0.187	3.210 (0.073)
Became parent	-0.072	0.850 (0.357)	0.126	0.292 (0.589	-0.044	0.033 (0.855)	0.264	1.363 (0.243)	0.299	1.650 (0.199)
More children	-0.382	4.408 (0.036)	0.058	0.019 (0.891)	-0.133	0.088 (0.767)	-0.004	0.000 (0.993)	-1.398	3.992 (0.046)
Fewer children	0.083	0.251 (0.616)	0.275	0.419 (0.517)	0.444	1.239 (0.266)	-0.485	0.719 (0.397)	0.019	0.002 (0.966)
No longer have children	**0.299**	8.244 (0.004)	0.493	2.621 (0.106)	0.413	2.018 (0.155)	0.123	0.159 (0.691)	-0.665	1.771 (0.183)
*Interaction Gender*Children*										
No children	*reference*	---	*reference*	---	*reference*	---	*reference*	---	*reference*	---

Parent, no change	**-0.460**	36.799 (0.000)	-0.301	4.918 (0.027)	**-0.387**	8.842 (0.003)	**-0.409**	9.230 (0.002)	-0.150	1.027 (0.311)
Became parent	-0.161	1.510 (0.219)	-0.358	0.572 (0.450)	0.516	1.957 (0.162)	0.187	0.233 (0.630)	0.114	0.090 (0.764)
More children	-0.605	2.938 (0.087)	-0.792	0.546 (0.460)	-0.678	0.716 (0.398)	0.225	0.102 (0.749)	1.661	3.751 (0.053)
Fewer children	-0.143	0.429 (0.512)	-1.097	1.996 (0.158)	-0.338	0.367 (0.545)	0.727	1.079 (0.299)	-0.209	0.095 (0.757)
No longer have children	0.073	0.279 (0.597)	-1.144	4.406 (0.036)	-0.515	1.267 (0.260)	0.253	0.316 (0.574)	0.676	1.256 (0.262)
Main source of income										
Wage	*reference*	---	*reference*	---	*reference*	---	*reference*	---	*reference*	---
Agriculture and forestry	**-1.866**	87.249 (0.000)	**-2.450**	39.463 (0.000)	**-1.593**	13.193 (0.000)	**-2.377**	41.547 (0.000)	**-2.258**	45.016 (0.000)
Business activity	**0.220**	57.466 (0.000)	**0.259**	23.218 (0.000)	**0.210**	16.034 (0.000)	**0.295**	28.299 (0.000)	**0.361**	37.254 (0.000)
Capital	**-0.214**	11.754 (0.001)	**-0.420**	10.788 (0.001)	**-0.423**	10.543 (0.001)	**-0.518**	17.084 (0.000)	**-0.528**	14.327 (0.000)
Other	-0.074	1.982 (0.159)	-0.218	3.850 (0.050)	-0.110	1.079 (0.299)	-0.197	3.918 (0.048)	0.090	0.816 (0.366)
Denomination										
Protestant	*reference*	---	*reference*	---	*reference*	---	*reference*	---	*reference*	---
Catholic	**-0.357**	220.105 (0.000)	**-0.276**	35.790 (0.000)	**-0.254**	32.425 (0.000)	**-0.291**	34.092 (0.000)	-0.124	6.141 (0.013)

Land										
North Rhine-Westphalia	*reference*	---	*reference*	---	*reference*	---	*reference*	---	*reference*	---
Baden-Württemberg	**-0.160**	17.257 (0.000)	**-0.284**	12.763 (0.000)	0.120	2.876 (0.090)	-0.082	1.098 (0.295)	-0.061	0.572 (0.450)
Bavaria	-0.082	5.715 (0.017)	**-0.180**	7.234 (0.007)	-0.147	4.846 (0.028)	-0.132	3.427 (0.064)	-0.107	2.261 (0.133)
Bremen	**0.725**	125.448 (0.000)	**0.632**	30.306 (0.000)	**0.897**	66.324 (0.000)	**0.584**	20.251 (0.000)	**0.488**	7.887 (0.005)
Hamburg	**1.013**	289.150 (0.000)	**0.817**	60.747 (0.000)	**1.193**	157.092 (0.000)	**1.359**	187.635 (0.000)	**1.131**	80.373 (0.000)
Hesse	0.102	5.609 (0.018)	0.102	1.590 (0.207)	0.055	0.449 (0.503)	0.132	2.367 (0.124)	0.150	2.833 (0.092)
Lower Saxony	0.068	2.410 (0.121)	0.147	3.333 (0.068)	**0.249**	10.066 (0.002)	0.107	1.500 (0.221)	0.148	2.704 (0.100)
Rhineland-Palatinate	**-0.203**	14.958 (0.000)	-0.212	4.260 (0.039)	0.051	0.293 (0.588)	-0.117	1.215 (0.270)	-0.220	3.741 (0.053)
Saarland	**-0.323**	19.538 (0.000)	**-0.263**	3.570 (0.059)	-0.193	1.899 (0.168)	-0.112	0.587 (0.444)	-0.345	4.507 (0.034)
Schleswig-Holstein	**0.305**	27.928 (0.000)	**0.336**	10.335 (0.001)	**0.427**	17.397 (0.000)	**0.428**	14.899 (0.000)	**0.450**	14.753 (0.000)
Berlin	**1.256**	651.065 (0.000)	**1.213**	207.151 (0.000)	**1.195**	185.840 (0.000)	**1.080**	122.630 (0.000)	**1.093**	111.967 (0.000)
Brandenburg	0.099	1.020 (0.313)	0.090	0.229 (0.632)	0.181	0.927 (0.336)	0.004	0.000 (0.985)	0.045	0.042 (0.838)
Mecklenburg-W. Pomerania	0.141	1.706 (0.192)	0.133	0.498 (0.481)	0.027	0.016 (0.900)	-0.217	0.630 (0.427)	0.497	5.940 (0.015)

Saxony	0.147	4.270 (0.039)	-0.019	0.016 (0.899)	0.016	0.013 (0.910)	0.067	0.201 (0.654)	-0.036	0.049 (0.825)
Saxony-Anhalt	**0.285**	8.471 (0.004)	0.341	3.399 (0.065)	-0.040	0.034 (0.853)	-0.181	0.654 (0.419)	0.084	0.141 (0.707)
Thuringia	**-0.399**	21.583 (0.000)	-0.256	2.471 (0.116)	-0.435	6.404 (0.011)	-0.369	4.700 (0.030)	**-0.547**	6.825 (0.009)
Mobility										
No mobility	*reference*	---	*reference*	---	*reference*	---	*reference*	---	*reference*	---
West-West	**1.461**	1208.793 (0.000)	0.396	4.406 (0.036)	**0.603**	15.996 (0.000)	**0.616**	15.302 (0.000)	**0.598**	13.527 (0.000)
West-East	**3.505**	1676.500 (0.000)	**1.326**	8.878 (0.003)	**1.129**	7.136 (0.008)	0.336	0.459 (0.498)	**1.332**	9.705 (0.002)
East-East	**2.454**	115.804 (0.000)	0.875	1.353 (0.245)	0.707	0.418 (0.518)	1.327	1.599 (0.206)	**-8.906**	588.816 (0.000)
East-West	**0.919**	55.246 (0.000)	-0.441	0.397 (0.529)	-0.027	0.005 (0.943)	0.462	0.947 (0.331)	0.343	0.413 (0.521)
Sample size	165,146		172,199		169,140		165,229		161,579	
-2 Log L (constant only)	2,769,469		912,658		968,943		842,720		790,234	
-2 Log L (constant and covariates)	2,426,852		868,309		915,956		800,099		742,211	
Likelihood-Ratio χ^2	342,617 (53 df)		44,349 (53 df)		52,987 (53 df)		42,621 (53 df)		48,024 (53 df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.

Note: Bold coefficients are significant at the 1 percent level.

In Table A.5 I present separate estimations for church disaffiliations that happen in each year between 2002 and 2005. The motivation is to make better use of the panel structure of the data and to see if results in Chapter 4, which are based on the period between 2001 and 2005, are constant over time. The results in Table A.5 confirm the overall conclusion from the main discussion in Chapter 4: both the price of church membership in the original year and the change in price have a positive and significant effect on the probability to disaffiliate. The estimated effects of the price level are similar to that found for the complete sample in Table 4.2, with the exception of the results for the year 2005, where it is somewhat smaller. When looking at the change in the price of membership, all estimates in Table A.5 are smaller than in the estimates for the complete sample. One can also observe a decrease in the size of the estimates for the variable *"Δ Price"* over time. In addition, in the estimations for the years 2004 and 2005 the dummy variables indicating whether someone had to pay at all for being a church member is negative and significant. This is contrary to expectations because it suggests that those who have to pay for membership are less likely to leave the church. Taken together, the findings suggest that the effect of the price of membership plays a larger role in the membership decision in 2002 and 2003 than it does in 2004 and 2005. They also support the conclusion that inertia plays a role in the membership decision. The consistent estimates of a positive effect of the price level point to the fact that people do not react to price changes immediately, but after experiencing a higher price for some period of time. This picture is reinforced by the smaller size of the effect of a change in the price of membership when looking at only one year as opposed to a five year period. It seems that only some individuals react to price changes immediately, while others react with some lag that only shows in the estimation for a longer time period.

D.3 Results for selected subsamples

Table A.6: Estimation results for the complete sample, and for the subsamples of West Germany and East Germany separately

	Complete sample		**West Germany**		**East Germany**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Intercept	**-2.072**	2535.800 (0.000)	**-2.119**	2373.874 (0.000)	**-1.373**	220.953 (0.000)
Price of church membership						
Price 2001	**0.059**	125.619 (0.000)	**0.061**	111.981 (0.000)	**0.029**	6.927 (0.009)
Dummy Price 2001 positive	0.022	0.5388 (0.463)	0.047	2.107 (0.147)	**-0.187**	7.206 (0.007)
Δ Price	**0.055**	164.905 (0.000)	**0.057**	155.832 (0.000)	0.026	6.456 (0.011)
Income						
Income 2001	-0.000	0.0261 (0.872)	-0.000	0.090 (0.764)	0.001	0.329 (0.566)
Δ Income	**-0.002**	8.334 (0.004)	-0.002	6.521 (0.011)	-0.003	2.739 (0.098)
Age						
Below 25	*reference*	---	*reference*	---	*reference*	---
25 to 34	0.049	2.459 (0.117)	0.085	6.421 (0.011)	**-0.394**	23.389 (0.000)
35 to 44	**-0.361**	99.527 (0.000)	**-0.331**	72.870 (0.000)	**-0.787**	69.416 (0.000)
45 to 54	**-0.857**	368.981 (0.000)	**-0.851**	307.168 (0.000)	**-1.087**	102.135 (0.000)
55 to 64	**-1.527**	572.462 (0.000)	**-1.565**	465.658 (0.000)	**-1.509**	134.117 (0.000)
65 and above	**-2.588**	991.511 (0.000)	**-2.620**	803.792 (0.000)	**-2.510**	228.400 (0.000)
Gender						
Male	*reference*	---	*reference*	---	*reference*	---
Female	0.020	0.646 (0.422)	0.032	1.521 (0.218)	-0.109	2.850 (0.091)
Children						
No children	*reference*	---	*reference*	---	*reference*	---
Parent, no change	**0.188**	12.606 (0.000)	**0.283**	25.535 (0.000)	**-0.535**	14.060 (0.000)

Became parent	-0.072	0.850 (0.357)	-0.039	0.196 (0.658)	-0.272	2.976 (0.085)
More children	-0.382	4.408 (0.036)	-0.302	2.284 (0.131)	-0.710	3.131 (0.077)
Fewer children	0.083	0.251 (0.616)	0.028	0.023 (0.880)	0.349	1.062 (0.303)
No longer have children	**0.299**	8.244 (0.004)	**0.306**	7.093 (0.008)	0.255	1.101 (0.294)
*Interaction Gender*Children*						
No children	*reference*	---	*reference*	---	*reference*	---
Parent, no change	**-0.460**	36.799 (0.000)	**-0.510**	38.907 (0.000)	0.101	0.288 (0.591)
Became parent	-0.161	1.510 (0.219)	-0.197	1.648 (0.199)	0.037	0.022 (0.882)
More children	-0.605	2.938 (0.087)	-0.433	1.234 (0.267)	-1.095	2.064 (0.151)
Fewer children	-0.143	0.429 (0.512)	-0.054	0.049 (0.826)	-0.477	0.952 (0.329)
No longer have children	0.073	0.279 (0.597)	0.101	0.448 (0.503)	-0.030	0.009 (0.923)
Main source of income						
Wage	*reference*	---	*reference*	---	*reference*	---
Agriculture and forestry	**-1.866**	87.249 (0.000)	**-1.850**	76.945 (0.000)	**-1.810**	17.004 (0.000)
Business activity	**0.220**	57.466 (0.000)	**0.267**	71.686 (0.000)	-0.123	3.166 (0.075)
Capital	**-0.214**	11.754 (0.001)	**-0.194**	8.155 (0.004)	**-0.382**	7.233 (0.007)
Other	-0.074	1.982 (0.159)	-0.078	1.673 (0.196)	-0.135	1.672 (0.196)
Denomination						
Protestant	*reference*	---	*reference*	---	*reference*	---
Catholic	**-0.357**	220.105 (0.000)	**-0.384**	230.851 (0.000)	0.029	0.187 (0.665)
Land						
North Rhine-Westphalia	*reference*	---	*reference*	---		
Baden-Württemberg	**-0.160**	17.257 (0.000)	**-0.161**	17.343 (0.000)		

Bavaria	-0.082	5.715 (0.017)	-0.074	4.591 (0.032)		
Bremen	**0.725**	125.448 (0.000)	**0.712**	119.745 (0.000)		
Hamburg	**1.013**	289.150 (0.000)	**0.995**	275.608 (0.000)		
Hesse	0.102	5.609 (0.018)	0.094	4.795 (0.029)		
Lower Saxony	0.068	2.410 (0.121)	0.062	1.968 (0.161)		
Rhineland-Palatinate	**-0.203**	14.958 (0.000)	**-0.202**	14.735 (0.000)		
Saarland	**-0.323**	19.538 (0.000)	**-0.315**	18.493 (0.000)		
Schleswig-Holstein	**0.305**	27.928 (0.000)	**0.290**	25.038 (0.000)		
Berlin	**1.256**	651.065 (0.000)			**1.152**	200.999 (0.000)
Brandenburg	0.099	1.020 (0.313)			-0.004	0.001 (0.973)
Mecklenburg-W. Pomerania	0.141	1.706 (0.192)			0.028	0.056 (0.813)
Saxony	0.147	4.270 (0.039)			*reference*	---
Saxony-Anhalt	**0.285**	8.471 (0.004)			0.134	1.372 (0.242)
Thuringia	**-0.399**	21.583 (0.000)			**-0.634**	36.019 (0.000)
Mobility						
No mobility	*reference*	---	*reference*	---	*reference*	---
West-West	**1.461**	1208.793 (0.000)	**1.486**	1221.887 (0.000)		
West-East	**3.505**	1676.500 (0.000)	**3.536**	1680.574 (0.000)		
East-East	**2.454**	115.804 (0.000)			**2.320**	115.629 (0.000)
East-West	**0.919**	55.246 (0.000)			**0.677**	27.909 (0.000)

Sample size	165,146		144,675		20,471	
-2 Log L (constant only)	2,769,469		2,518,574		243,573	
-2 Log L (constant and covariates)	2,426,852		2,205,089		216,683	
Likelihood-Ratio χ^2	342,617 (53 df)		313,485 (51 df)		26,890 (51 df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Areas shaded in grey refer to variables that are not included in the estimation for the particular subsample. Bold coefficients are significant at the 1 percent level.

Table A.7: Estimation results for the complete sample, and for the subsamples of Protestants and Catholics separately

	Complete sample		**Protestants**		**Catholics**	
	Model 1a		**Model 1a**		**Model 1a**	
	coeff.	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**	**coeff.**	**Wald χ^2 (p-value)**
Intercept	**-2.072**	2535.800 (0.000)	**-1.906**	1342.749 (0.000)	**-2.588**	1940.707 (0.000)
Price of church membership						
Price 2001	**0.059**	125.619 (0.000)	**0.055**	64.995 (0.000)	**0.063**	56.868 (0.000)
Dummy Price 2001 positive	0.022	0.5388 (0.463)	0.058	2.232 (0.135)	-0.020	0.185 (0.667)
Δ Price	**0.055**	164.905 (0.000)	**0.051**	85.550 (0.000)	**0.059**	63.916 (0.000)
Income						
Income 2001	-0.000	0.0261 (0.872)	0.002	1.669 (0.196)	-0.003	1.632 (0.201)
Δ Income	**-0.002**	8.334 (0.004)	-0.001	1.383 (0.240)	-0.004	5.529 (0.019)
Age						
Below 25	*reference*	---	*reference*	---	*reference*	---
25 to 34	0.049	2.459 (0.117)	-0.029	0.491 (0.483)	**0.130**	7.479 (0.006)
35 to 44	**-0.361**	99.527 (0.000)	**-0.477**	99.871 (0.000)	**-0.236**	18.156 (0.000)
45 to 54	**-0.857**	368.981 (0.000)	**-0.917**	248.895 (0.000)	**-0.802**	132.919 (0.000)
55 to 64	**-1.527**	572.462 (0.000)	**-1.524**	373.899 (0.000)	**-1.599**	208.387 (0.000)
65 and above	**-2.588**	991.511 (0.000)	**-2.608**	717.852 (0.000)	**-2.599**	298.493 (0.000)
Gender						
Male	*reference*	---	*reference*	---	*reference*	---
Female	0.020	0.646 (0.422)	-0.050	2.351 (0.125)	**0.101**	7.209 (0.007)
Children						
No children	*reference*	---	*reference*	---	*reference*	---
Parent, no change	**0.1881**	12.606 (0.000)	0.141	4.066 (0.044)	**0.242**	8.780 (0.003)
Became parent	-0.072	0.850 (0.357)	-0.033	0.110 (0.740)	-0.128	1.033 (0.310)

More children	-0.382	4.408 (0.036)	-0.300	1.665 (0.197)	-0.530	3.239 (0.072)
Fewer children	0.083	0.251 (0.616)	-0.135	0.325 (0.569)	0.304	1.750 (0.186)
No longer have children	**0.299**	8.244 (0.004)	**0.344**	6.720 (0.010)	0.206	1.487 (0.223)
*Interaction Gender*Children*						
No children	*reference*	---	*reference*	---	*reference*	---
Parent, no change	**-0.460**	36.799 (0.000)	**-0.398**	16.398 (0.000)	**-0.519**	18.888 (0.000)
Became parent	-0.161	1.510 (0.219)	-0.157	0.897 (0.344)	-0.155	0.541 (0.462)
More children	-0.605	2.938 (0.087)	-1.191	5.463 (0.019)	0.095	0.037 (0.848)
Fewer children	-0.143	0.429 (0.512)	0.175	0.352 (0.553)	-0.526	2.412 (0.120)
No longer have children	0.073	0.279 (0.597)	0.095	0.303 (0.582)	0.063	0.074 (0.785)
Main source of income						
Wage	*reference*	---	*reference*	---	*reference*	---
Agriculture and forestry	**-1.866**	87.249 (0.000)	**-1.851**	82.565 (0.000)	**-1.870**	20.883 (0.000)
Business activity	**0.220**	57.466 (0.000)	**0.150**	16.175 (0.000)	**0.308**	45.391 (0.000)
Capital	**-0.214**	11.754 (0.001)	**-0.293**	13.473 (0.000)	-0.111	1.258 (0.262)
Other	-0.074	1.982 (0.159)	-0.170	6.474 (0.011)	0.053	0.404 (0.525)
Denomination						
Protestant	*reference*	---				
Catholic	**-0.357**	220.105 (0.000)				
Land						
North Rhine-Westphalia	*reference*	---	*reference*	---	*reference*	---
Baden-Württemberg	**-0.160**	17.257 (0.000)	**-0.163**	10.044 (0.002)	**-0.201**	11.463 (0.001)
Bavaria	-0.082	5.715 (0.017)	**-0.214**	14.160 (0.000)	0.023	0.261 (0.610)

Bremen	**0.725**	125.448 (0.000)	**0.637**	77.727 (0.000)	**0.833**	30.631 (0.000)
Hamburg	**1.013**	289.150 (0.000)	**0.922**	190.202 (0.000)	**1.170**	74.644 (0.000)
Hesse	0.102	5.609 (0.018)	-0.087	2.401 (0.121)	**0.361**	29.669 (0.000)
Lower Saxony	0.068	2.410 (0.121)	-0.007	0.016 (0.901)	0.129	2.463 (0.117)
Rhineland-Palatinate	**-0.203**	14.958 (0.000)	**-0.366**	21.674 (0.000)	-0.073	1.043 (0.307)
Saarland	**-0.323**	19.538 (0.000)	-0.331	5.803 (0.016)	**-0.289**	10.657 (0.001)
Schleswig-Holstein	**0.305**	27.928 (0.000)	**0.184**	8.686 (0.003)	**0.910**	29.055 (0.000)
Berlin	**1.256**	651.065 (0.000)	**1.082**	322.986 (0.000)	**1.544**	314.247 (0.000)
Brandenburg	0.099	1.020 (0.313)	-0.114	1.072 (0.300)	**0.813**	12.607 (0.000)
Mecklenburg-W. Pomerania	0.141	1.706 (0.192)	-0.026	0.053 (0.818)	0.540	4.873 (0.027)
Saxony	0.147	4.270 (0.039)	-0.024	0.088 (0.766)	**0.689**	18.439 (0.000)
Saxony-Anhalt	**0.285**	8.471 (0.004)	0.010	0.814 (0.367)	**0.740**	11.808 (0.001)
Thuringia	**-0.399**	21.583 (0.000)	**-0.502**	25.411 (0.000)	**-0.310**	3.191 (0.074)
Mobility						
No mobility	*reference*	---	*reference*	---	*reference*	---
West-West	**1.461**	1208.793 (0.000)	**1.162**	398.123 (0.000)	**1.761**	875.453 (0.000)
West-East	**3.505**	1676.500 (0.000)	**3.129**	736.605 (0.000)	**3.898**	977.753 (0.000)
East-East	**2.454**	115.804 (0.000)	**2.446**	87.648 (0.000)	**2.414**	25.353 (0.000)
East-West	**0.919**	55.246 (0.000)	**0.819**	32.880 (0.000)	**1.092**	19.870 (0.000)

Sample size	165,146		86,575		78,571	
-2 Log L (constant only)	2,769,469		1,480,215		1,274,641	
-2 Log L (constant and covariates)	2,426,852		1,310,355		1,108,689	
Likelihood-Ratio χ^2	342,617 (53 df)		169,860 (52 df)		165,951 (52 df)	

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Areas shaded in grey refer to variables that are not included in the estimation for the particular subsample. Bold coefficients are significant at the 1 percent level.

Appendix E: Additional results for Chapter 5

Table A.8: Estimation results and marginal effects of Heckman estimation for total donations in 2003 of regular itemizers

	Estimation results				**Marginal effects**		
Variable	**Participation**		**Outcome**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-5.076	0.058 (0.000)	-5.025	0.090 (0.000)			
Price (log)	-0.305	0.018 (0.000)	-0.931	0.027 (0.000)	-0.121	-0.649	-0.868
Income (log)	0.446	0.006 (0.000)	0.782	0.009 (0.000)	0.177	0.371	1.001
Type of assessment and gender							
Single male	-0.053	0.006 (0000)	0.016	0.010 (0.114)	-0.021	0.065	-0.070
Single female	0.096	0.006 (0.000)	0.162	0.010 (0.000)	0.038	0.074	0.216
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.314	0.008 (0.000)	-0.580	0.013 (0.000)	-0.125	-0.301	-0.754
One	-0.313	0.008 (0.000)	-0.638	0.013 (0.000)	-0.124	-0.360	-0.779
Two	-0.171	0.008 (0.000)	-0.410	0.013 (0.000)	-0.068	-0.262	-0.469
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.097	0.010 (0.000)	1.801	0.016 (0.000)	0.416	0.853	2.498
60-69	0.846	0.008 (0.000)	1.318	0.015 (0.000)	0.327	0.551	1.831
50-59	0.451	0.007 (0.000)	0.631	0.014 (0.000)	0.173	0.196	0.876
40-49	0.279	0.007 (0.000)	0.387	0.013 (0.000)	0.105	0.111	0.521
30-39	0.154	0.007 (0.000)	0.197	0.013 (0.000)	0.057	0.042	0.271
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

Region							
East Germany	-0.204	0.007 (0.000)	-0.313	0.012 (0.000)	-0.080	-0.119	-0.422
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Member	0.134	0.006 (0.000)	-0.041	0.010 (0.000)	0.053	-0.167	0.178
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.129	0.013 (0.000)	-0.456	0.024 (0.000)	-0.049	-0.331	-0.362
Year of disaffiliation	-0.141	0.017 (0.000)	-0.471	0.030 (0.000)	-0.054	-0.334	-0.383
After disaffiliation	-0.109	0.017 (0.000)	-0.367	0.030 (0.000)	-0.042	-0.261	-0.301
N	579,873						
ρ	0.855	0.002 (0.000)					
σ			1,644				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers only; borderline itemizers and non-itemizers are excluded. Sample is a cross-section of the year 2003. P-values of t-tests are given in parentheses.

Table A.9: Estimation results and marginal effects of Cragg's two-part model for total donations in 2003 of regular itemizers

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-4.374	0.248 (0.000)	-0.540	0.072 (0.000)			
Price (log)	-0.360	0.061 (0.000)	-0.624	0.021 (0.000)	-0.143	-0.624	-0.968
Income (log)	0.373	0.025 (0.000)	0.511	0.007 (0.000)	0.148	0.510	0.938
Type of assessment and gender							
Single male	-0.091	0.016 (0.000)	0.134	0.008 (0.000)	-0.036	0.134	-0.110
Single female	0.063	0.017 (0.000)	0.126	0.008 (0.000)	0.025	0.126	0.178
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.299	0.014 (0.000)	-0.334	0.010 (0.000)	-0.119	-0.334	-0.747
One	-0.292	0.013 (0.000)	-0.403	0.010 (0.000)	-0.116	-0.403	-0.765
Two	-0.154	0.012 (0.000)	-0.295	0.009 (0.000)	-0.061	-0.295	-0.456
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.109	0.019 (0.000)	0.827	0.012 (0.000)	0.420	0.826	2.516
60-69	0.853	0.015 (0.000)	0.530	0.012 (0.000)	0.330	0.530	1.842
50-59	0.463	0.012 (0.000)	0.155	0.011 (0.000)	0.177	0.155	0.882
40-49	0.292	0.012 (0.000)	0.059	0.011 (0.000)	0.110	0.059	0.524
30-39	0.166	0.011 (0.000)	-0.008	0.011 (0.445)	0.061	-0.008	0.274
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

Region							
East Germany	-0.217	0.009 (0.000)	-0.087	0.010 (0.000)	-0.085	-0.087	-0.434
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Church member	0.163	0.008 (0.000)	-0.222	0.008 (0.000)	0.064	-0.222	0.212
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.102	0.020 (0.000)	-0.387	0.019 (0.000)	-0.039	-0.386	-0.335
Year of disaffiliation	-0.108	0.026 (0.000)	-0.407	0.024 (0.000)	-0.041	-0.406	-0.352
After disaffiliation	-0.092	0.025 (0.000)	-0.303	0.023 (0.000)	-0.035	-0.303	-0.287
N	579,873		342,680				
σ			1.226				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers only; borderline itemizers and non-itemizers are excluded. Sample is a cross-section of the year 2003. P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

Table A.10: Estimation results and marginal effects of Heckman estimation for total donations in 2003 of regular itemizers in all sample years

	Estimation results				**Marginal effects**		
Variable	**Participation**		**Outcome**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-6.150	0.107 (0.000)	-6.382	0.146 (0.000)			
Price (log)	0.014	0.033 (0.672)	-0.619	0.045 (0.000)	0.006	-0.631	-0.302
Income (log)	0.585	0.011 (0.000)	0.973	0.014 (0.000)	0.233	0.475	1.358
Type of assessment and gender							
Single male	0.008	0.009 (0.387)	0.125	0.014 (0.000)	0.003	0.118	0.075
Single female	0.156	0.009 (0.000)	0.261	0.014 (0.000)	0.062	0.131	0.366
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.342	0.012 (0.000)	-0.552	0.017 (0.000)	-0.134	-0.275	-0.812
One	-0.343	0.012 (0.000)	-0.639	0.017 (0.000)	-0.134	-0.360	-0.856
Two	-0.183	0.011 (0.000)	-0.386	0.017 (0.000)	-0.071	-0.242	-0.493
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.143	0.014 (0.000)	1.919	0.022 (0.000)	0.418	1.039	2.731
60-69	0.899	0.012 (0.000)	1.445	0.020 (0.000)	0.343	0.714	2.079
50-59	0.402	0.010 (0.000)	0.588	0.018 (0.000)	0.159	0.229	0.846
40-49	0.232	0.010 (0.000)	0.357	0.018 (0.000)	0.091	0.144	0.481
30-39	0.112	0.010 (0.000)	0.152	0.018 (0.000)	0.043	0.047	0.217
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

Region							
East Germany	-0.088	0.012 (0.000)	-0.081	0.019 (0.000)	-0.035	-0.005	-0.170
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Member	-0.066	0.019 (0.000)	-0.567	0.028 (0.000)	-0.026	-0.511	-0.403
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.312	0.033 (0.000)	-0.904	0.052 (0.000)	-0.124	-0.630	-0.920
Year of disaffiliation	-0.248	0.049 (0.000)	-0.938	0.077 (0.000)	-0.099	-0.722	-0.844
After disaffiliation	-0.263	0.041 (0.000)	-0.858	0.065 (0.000)	-0.105	-0.629	-0.829
N	313,448						
ρ	0.849	0.002 (0.000)					
σ			1.603				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of taxpayers who are regular itemizers in all sample years. Taxpayers who are non-itemizers or borderline itemizers in any year are excluded. Sample is a cross-section of the year 2003. P-values of t-tests are given in parentheses.

Table A.11: Estimation results and marginal effects of Cragg's two-part model for total donations in 2003 of regular itemizers in all sample years

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-5.278	0.423 (0.000)	-2.025	0.114 (0.000)			
Price (log)	-0.078	0.106 (0.461)	-0.431	0.035 (0.000)	-0.031	-0.431	-0.373
Income (log)	0.494	0.042 (0.000)	0.683	0.011 (0.000)	0.197	0.683	1.297
Type of assessment and gender							
Single male	-0.043	0.028 (0.119)	0.236	0.011 (0.000)	-0.017	0.236	0.036
Single female	0.109	0.028 (0.000)	0.228	0.011 (0.000)	0.043	0.228	0.330
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.342	0.020 (0.000)	-0.270	0.012 (0.000)	-0.134	-0.270	-0.814
One	-0.334	0.019 (0.000)	-0.376	0.012 (0.000)	-0.131	-0.376	-0.852
Two	-0.175	0.017 (0.000)	-0.258	0.012 (0.000)	-0.068	-0.258	-0.489
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.162	0.027 (0.000)	0.970	0.017 (0.000)	0.424	0.969	2.734
60-69	0.901	0.022 (0.000)	0.674	0.016 (0.000)	0.344	0.674	2.075
50-59	0.407	0.016 (0.000)	0.180	0.014 (0.000)	0.161	0.180	0.838
40-49	0.237	0.016 (0.000)	0.091	0.014 (0.000)	0.093	0.091	0.470
30-39	0.119	0.016 (0.000)	-0.004	0.014 (0.766)	0.046	-0.004	0.210
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

Region							
East Germany	-0.103	0.016 (0.000)	0.020	0.015 (0.187)	-0.041	0.020	-0.188
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Church member	0.000	0.026 (0.996)	-0.618	0.021 (0.000)	0.000	-0.617	-0.320
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.259	0.046 (0.000)	-0.734	0.040 (0.000)	-0.103	-0.733	-0.860
Year of disaffiliation	-0.166	0.071 (0.018)	-0.869	0.058 (0.000)	-0.066	-0.869	-0.752
After disaffiliation	-0.225	0.060 (0.000)	-0.702	0.050 (0.000)	-0.089	-0.702	-0.784
N	313,448		210,448				
σ			1.222				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers only; borderline itemizers and non-itemizers are excluded. Sample is a cross-section of the year 2003. P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

Table A.12: Estimation results and marginal effects of Heckman estimation for regular itemizers and for donations which are tax deductible up to an amount of 5 % of overall income

	Estimation results				**Marginal effects**		
Variable	**Participation**		**Outcome**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-5.087	0.026 (0.000)	-6.516	0.043 (0.000)			
Price (log)	-0.071	0.008 (0.000)	-0.450	0.013 (0.000)	-0.027	-0.381	-0.269
Income (log)	0.424	0.003 (0.000)	0.908	0.004 (0.000)	0.161	0.492	0.937
Type of assessment and gender							
Single male	-0.040	0.003 (0.000)	0.099	0.004 (0.000)	-0.015	0.138	-0.020
Single female	0.088	0.003 (0.000)	0.227	0.004 (0.000)	0.034	0.142	0.213
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.260	0.003 (0.000)	-0.511	0.006 (0.000)	-0.101	-0.262	-0.593
One	-0.268	0.003 (0.000)	-0.581	0.006 (0.000)	-0.104	-0.325	-0.630
Two	-0.148	0.003 (0.000)	-0.378	0.006 (0.000)	-0.058	-0.239	-0.384
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	0.945	0.004 (0.000)	1.672	0.007 (0.000)	0.359	0.787	2.102
60-69	0.717	0.004 (0.000)	1.197	0.007 (0.000)	0.269	0.502	1.479
50-59	0.400	0.003 (0.000)	0.583	0.006 (0.000)	0.144	0.178	0.720
40-49	0.250	0.003 (0.000)	0.341	0.006 (0.000)	0.087	0.083	0.421
30-39	0.126	0.003 (0.000)	0.146	0.006 (0.000)	0.043	0.015	0.196
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

Region							
East Germany	-0.244	0.003 (0.000)	-0.355	0.006 (0.000)	-0.089	-0.110	-0.448
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Member	0.190	0.003 (0.000)	-0.040	0.005 (0.000)	0.070	-0.230	0.254
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	-0.101	0.006 (0.000)	-0.486	0.012 (0.000)	-0.035	-0.381	-0.280
Year of disaffiliation	-0.116	0.008 (0.000)	-0.498	0.016 (0.000)	-0.040	-0.378	-0.302
After disaffiliation	-0.054	0.007 (0.000)	-0.347	0.013 (0.000)	-0.019	-0.292	-0.179
N	3,295,334						
ρ	0.844	0.001 (0.000)					
σ			1.661				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers only; borderline itemizers and non-itemizers are excluded. Estimation also includes year dummies (results not shown). P-values for t-tests are given in parentheses.

Table A.13: Estimation results and marginal effects of Cragg's two-part model for regular itemizers and non-itemizers and for donations which are tax deductible up to an amount of 5 % of overall income

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On probability**	**Conditional**	**Unconditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-2.878	0.017 (0.000)	0.427	0.029 (0.000)			
Price (log)	-2.218	0.006 (0.000)	-1.660	0.008 (0.000)	-0.597	-1.656	-2.883
Income (log)	0.117	0.002 (0.000)	0.361	0.003 (0.000)	0.031	0.360	0.203
Type of assessment and gender							
Single male	-0.259	0.003 (0.000)	0.030	0.003 (0.000)	-0.067	0.030	-0.283
Single female	-0.105	0.003 (0.000)	0.037	0.003 (0.000)	-0.029	0.037	-0.117
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.250	0.004 (0.000)	-0.330	0.004 (0.000)	-0.072	-0.330	-0.391
One	-0.223	0.004 (0.000)	-0.376	0.004 (0.000)	-0.065	-0.375	-0.368
Two	-0.116	0.004 (0.000)	-0.273	0.004 (0.000)	-0.035	-0.273	-0.221
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	1.004	0.005 (0.000)	0.875	0.005 (0.000)	0.308	0.874	1.655
60-69	0.736	0.005 (0.000)	0.546	0.005 (0.000)	0.207	0.545	1.039
50-59	0.385	0.004 (0.000)	0.148	0.005 (0.000)	0.093	0.148	0.419
40-49	0.229	0.004 (0.000)	0.040	0.005 (0.000)	0.051	0.040	0.219
30-39	0.105	0.004 (0.000)	-0.029	0.005 (0.000)	0.022	-0.028	0.087
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

Region							
East Germany	-0.405	0.003 (0.000)	0.009	0.005 (0.040)	-0.095	0.009	-0.410
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Church member	0.405	0.003 (0.000)	-0.086	0.003 (0.000)	0.102	-0.086	0.428
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	0.075	0.009 (0.000)	-0.268	0.009 (0.000)	0.016	-0.267	0.032
Year of disaffiliation	0.050	0.012 (0.000)	-0.276	0.013 (0.000)	0.011	-0.276	0.009
After disaffiliation	0.043	0.008 (0.000)	-0.235	0.010 (0.000)	0.009	-0.234	0.008
N	5,014,594		1,684,296				
σ			1.205				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers and non-itemizers. Taxpayers are excluded in those years when they are borderline itemizers. Estimation also includes year dummies (results not shown). P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.

Table A.14: Estimation results and marginal effects of Cragg's two-part model for regular itemizers and non-itemizers and for donations which are tax deductible up to an amount of 10 % of overall income

	Estimation results				**Marginal effects**		
Variable	**Participation – Probit estimation**		**Outcome – Truncated regression**		**On pro-bability**	**Con-ditional**	**Uncon-ditional**
	Coeff.	**Std.err.**	**Coeff.**	**Std.err.**	**Coeff.**	**Coeff.**	**Coeff.**
Intercept	-3.387	0.032 (0.000)	0.059	0.042 (0.167)			
Price (log)	-1.636	0.010 (0.000)	-1.546	0.012 (0.000)	-0.206	-1.539	-0.955
Income (log)	0.128	0.003 (0.000)	0.370	0.004 (0.000)	0.016	0.368	0.091
Type of assessment and gender							
Single male	-0.179	0.004 (0.000)	0.112	0.005 (0.000)	-0.021	0.112	-0.081
Single female	-0.020	0.004 (0.000)	0.136	0.005 (0.000)	-0.003	0.136	-0.002
Married couple	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Number of children							
None	-0.140	0.005 (0.000)	-0.241	0.007 (0.000)	-0.019	-0.240	-0.098
One	-0.136	0.005 (0.000)	-0.305	0.007 (0.000)	-0.018	-0.304	-0.100
Two	-0.064	0.005 (0.000)	-0.223	0.007 (0.000)	-0.009	-0.222	-0.056
Three or more	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Age							
70 and above	0.712	0.007 (0.000)	0.877	0.009 (0.000)	0.105	0.875	0.542
60-69	0.566	0.006 (0.000)	0.540	0.009 (0.000)	0.074	0.538	0.357
50-59	0.297	0.006 (0.000)	0.155	0.008 (0.000)	0.031	0.154	0.136
40-49	0.222	0.006 (0.000)	0.064	0.008 (0.000)	0.022	0.064	0.092
30-39	0.162	0.006 (0.000)	0.025	0.009 (0.004)	0.015	0.025	0.062
Below 30	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*

Region							
East Germany	-0.070	0.004 (0.000)	0.088	0.006 (0.000)	-0.008	0.087	-0.030
West Germany	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Membership							
Church member	0.159	0.004 (0.000)	-0.012	0.005 (0.013)	0.019	-0.012	0.079
Non-member	*ref.*	---	*ref.*	---	*ref.*	*ref.*	*ref.*
Before disaffiliation	0.065	0.011 (0.000)	-0.157	0.014 (0.000)	0.007	-0.156	0.021
Year of disaffiliation	0.063	0.014 (0.000)	-0.151	0.018 (0.000)	0.007	-0.150	0.020
After disaffiliation	0.057	0.010 (0.000)	-0.171	0.014 (0.000)	0.006	-0.170	0.016
N	5,014,594		686,998				
σ			1.233				

Data source: Research Data Centres of the Federal Statistical Office and the statistical offices of the Länder, Taxpayer Panel 2001-2006, own calculations.
Note: Sample consists of regular itemizers and non-itemizers. Taxpayers are excluded in those years when they are borderline itemizers. Estimation also includes year dummies (results not shown). P-values for Wald's Chi-Square test (probit estimation) and t-test (truncated regression) are given in parentheses.