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The Bicausal Relation between Religion and Income

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The bicausal relation between religion and income

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Abstract

In this paper the relation between religion and income is investigated using a micro-dataset for the Netherlands. Religiosity is measured by religious membership and by participation. Instead of estimating separately a religion and an income equation, joint regression is preferred since this generally yields more efficient estimates. Following the single equation approach, both religious measures are found to decrease significantly income and income is found to affect negatively religion. However, these cross-effects get insignificant once the equations are simultaneously estimated. In contrast, the effects of socio-economic characteristics on religion and income hardly differ between both approaches.

Key words: Income, Religious Membership, Religious Participation

JEL classification: Z12

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1 Introduction

Weber (1930) initiated a still lively discussion about the relation between religion and income. He argued that the Protestant, and especially Calvinistic, religion stimulated rational capitalism resulting in a higher level of income for countries with a larger share of Protestants. This stimulus found its origin in the Protestant belief that work is a 'calling'. Not asceticism, but fulfilment of the obligations to reap the fruits hidden in the created world drives Protestants in the view of Weber. However, the evidence for this thesis is weak and alternative theories have emerged on how income is affected by religiosity.[1]

An alternative explanation for a positive effect stresses that a higher church attendance might expand social capital when churches are in fact civic organizations (Sacerdote and Glaeser, 2001). Network and interaction effects might in this case lead to more opportunities resulting in a higher level of income.[2]

According to Barro and McCleary (2003), belief is the crucial factor influencing income. Church attendance in this view increases income mainly through strengthening religious beliefs. However, a higher input to the religion sector (i.e. church attendance), while keeping the output (i.e. believes) constant, would then result in a negative effect on income as less resources are available for productive activities (see also Azzi and Ehrenberg, 1975).

Furthermore, religion might reduce the utility derived from income. If a religion stresses the value of 'good works', like the Roman Catholic religion for example, the value of income reduces.[3] This theory would also predict a lower level of income for religious people.

Given the different arguments, the effect of religion on income is undetermined. Empirical analysis is necessary to test which effects dominate. The empirical literature on income effects of religion

[1] See Iannaccone (1998) for a thorough introduction to the economics of religion.

[2] Gruber (2005) shows with US micro-data that religious participation as well as income are higher when a larger share of the local population is of an individual's religion.

[3] Lelkes (2005) shows with microdata for Hungary that income is a less important source of happiness for people who are actively involved in religious activities.

Table 1: Literature income and religion

Nr.	Country	Level data	Measure religion	Effect on income
1.	USA	Micro: men	Membership	Positive (Jewish)
2.	Canada	Micro: men	Membership	Insignificant (within Memberships)
3.	Canada	Micro: men	Membership	Positive (Jewish)
				Insignificant (Protestants vs. Catholics)
4.	USA	Micro: men	Membership	Positive (Jewish)
5.	USA	States	Membership	Positive (Jewish)
				Insignificant (liberal Protestant)
				Negative (Catholic and Orthodox Protestant)
6.	USA	Micro: Men	Membership,	Positive (Jewish and Catholic)
				Insignificant (within Protestants)
			Participation	Negative (Protestants)
				Insignificant (other Memberships)
7.	USA	States	Membership	Insignificant
8.	USA	States	Membership	Negative
9.	USA	Micro: women	Membership,	Insignificant (pay per hour)
			Participation	Positive (on hours worked)
10.	Several (max. 58)	Country	Membership,	Negative
			Participation,	Negative
			Beliefs	Positive

1. Chiswick (1983), 2. Tomes (1984), 3. Tomes (1985), 4. Chiswick (1993), 5. Heath et al. (1995), 6. Steen (1996), 7. Crain and Lee (1999), 8. Lipford and Tollison (2003), 9. Cornwell et al. (2003), 10. Barro and McCleary (2003)

is summarized in Table 1.[4] Almost all studies focus on the differences in effect between denominations (Jewish, Catholic, Protestant, etc.). Crain and Lee (1999) and Lipford and Tollison (2003), however, analyze the effect of church membership without distinguishing denominations. With the exception of Steen (1996), only recently the participation effect of religious behavior is empirically tested (Cornwell et al., 2003 and Barro and McCleary, 2003). Till the cross-country study of Barro and McCleary (2003) all results are based on data for Canada and the USA. The results are always positive for the Jewish belief. More mixed results are found for other denominations and for participation.

[4] Also other effects are analyzed in the literature like effects on mental and physical health, crime, divorce, etc. See Iannaccone (1998) for an excellent overview.

A second strand of the literature analyses the reverse relation, i.e. the effect of income (and other socio-economic characteristics) on religion. According to Iannaccone (1998) this literature finds a strong positive relation between income and financial contributions to churches, but often a weak relation with other religious variables (attendance, membership, frequency of prayer and beliefs).

Although these two types of analyses suggest that there might be a bicausal relationship between religion and income, most studies ignore the endogeneity of religion. As long as the role of endogeneity is unclear, the general conclusions of the literature can be questioned as neglect of endogeneity might result in biased estimations. One exception is Lipford and Tollison (2003). They estimate a system of equations to account for the effect of church membership on income but also for the reverse effect. They find that not only the estimated effect of church membership on income is negative, but also the effect of income on church membership. Furthermore, the estimate of the former effect doubles compared with single equation estimation.

Also Barro and McCleary (2003) take the endogeneity issue seriously. They solve for this problem by using instrumental variables in a three-stage least squares estimation. Again they find that endogeneity is important and that correcting for this problem results in larger coefficients with the same sign. They find that religion influences income growth negatively when measured by church attendance and positively when measured by beliefs (in hell and heaven).

While Lipford and Tollison (2003) use a state level database with 153 observations for the USA, Barro and McCleary (2003) use a panel database with 181 observations for 59 countries. This paper analyses a micro-dataset for the Netherlands with observations for 27,908 households. We find that estimating the income and the religion equation separately or simultaneously matters for the results. While religiosity is found to significantly reduce income when a single equation is estimated, joint estimation results in an insignificant effect.[5]

The contribution to the literature of this paper is threefold. First, we estimate the bicausal relation between religion and income for the Netherlands while the literature is dominated by results for

[5]Notice that even in the absence of a serious endogeneity problem, system estimation yields generally more efficient estimates by using the correlation of the disturbance terms.

the USA and Canada. Second, our dataset allows us to discriminate between the effect of religious membership and religious participation. Third, we show with microdata that both equations should be estimated jointly to explain the relation between religion and income.

The next two paragraphs discuss the estimation methodology and the data. Paragraph four explains the estimation results. The last paragraph concludes.

2 Methodology

We start by estimating the relation between religion measured by church membership and income. As both variables are measured as discrete variables, a probit-estimator is applied. Membership is denoted by the dummy y_{1i} with the value 1 if the household i is member of a church. As income is available only in deciles[6], y_{2i} denotes the after tax income class of household i. The system of *structural* equations is expressed in terms of the latent variables. This specification assumes that households have completely flexibility in their decisions but that the researcher can only observe the choices as discrete variables (see Blundell and Smith, 1994).[7] The structural model written in terms of the latent variables (y_1^* and y_2^*) and vectors of socio-economic control variables (x_1 and x_2) is:

$$\begin{aligned} y_{1i}^* &= \alpha_1 y_{2i}^* + \beta_1' x_{1i} + u_{1i} \qquad y_{1i} = 1 \quad \text{if } y_{1i}^* > 0, \ = 0 \text{ otherwise} \\ y_{2i}^* &= \alpha_2 y_{1i}^* + \beta_2' x_{2i} + u_{2i} \qquad y_{2i} = j \quad \text{if } \mu_{j-1} < y_{2i}^* \leq \mu_j \quad j = 1, ., J \end{aligned} \tag{2.1}$$

The second equation contains $J+1$ cutoffs μ_j. Assuming that y_2^* has an infinite support yields that $\mu_0 = -\infty$ and $\mu_J = \infty$. Since x_2 includes a constant, $\mu_1 = 0$ has to be imposed. The remaining $J-2$ cutoffs are estimated.

Model (2.1) cannot be directly estimated since it contains non-observables at the right-hand side.

[6] Statistics Netherlands calculates deciles from the original level data for privacy reasons.

[7] Maddala (1983, p. 124) interprets a latent variable as a measure of intensions. Blundell and Smith (1994) consider a class of structural models which are simultaneous in the observed dependent variables. As a consequence, the reduced form can not be derived explicitly and extra coherency restrictions have to be imposed.

Therefore, the *reduced* form equations are derived as, with $D \equiv (1 - \alpha_1 \alpha_2)$,

$$\begin{aligned} y_{1i}^* &= \bar{\beta}_1' x_i + v_{1i} \qquad \bar{\beta}_1' x_i = (\beta_1' x_{1i} + \alpha_1 \beta_2' x_{2i}) / D \qquad v_{1i} = (u_{1i} + \alpha_1 u_{2i}) / D \\ y_{2i}^* &= \bar{\beta}_2' x_i + v_{2i} \qquad \bar{\beta}_2' x_i = (\alpha_2 \beta_1' x_{1i} + \beta_2' x_{2i}) / D \qquad v_{2i} = (\alpha_2 u_{1i} + u_{2i}) / D \end{aligned} \tag{2.2}$$

where $x_i = x_{1i} \cup x_{2i}$. A variable that occurs in both structural equations thus has a coefficient equal to $(\beta_1 + \alpha_1 \beta_2) / D$ and $(\alpha_2 \beta_1 + \beta_2) / D$ in the reduced form equations, respectively. Identification of the structural coefficients requires that x_1 contains at least one variable that is not included in x_2 and vice versa. The reduced form disturbances v_k are assumed to have a joint normal distribution with means zero, variances one, and covariance ρ.[8] To compare the results of the system estimation, we also apply a probit-regression to each equation separately. The single equations are specified similarly as in (2.1), where the latent variable y_k^* at the RHS is replaced by the observed y_k.[9] The estimation procedure is explained in Appendix A.

In the estimation of a second system, religiosity is measured by church attendance. The binary y_1 is replaced by a dummy with the value 1 if the household attends church services at least once a week. The vector of control variables (x) in this system contains dummies indicating the denomination the household is member of. One could argue that the choice of the denomination should also be treated as an endogenous decision. However, this last option implies in our case simultaneous estimation of three equations (two ordered probits for income and denomination membership and one probit for participation). As this clearly results in econometric complexities, simplification is desirable.

This is motivated by the intuitive observation that endogeneity is a more serious problem with participation than with membership choice as most people stick to the church membership with which they are born with, while participation is changed far more often. Indeed, Tomes (1984) shows that more than 75% of Canadians keep their religion they are raised in (this figure is 86%

[8] This implies that the structural disturbances $u_k = v_k - \alpha_k v_{k'}$ $(k \neq k')$ are normally distributed with means zero, variances $(1 + \alpha_k^2 - 2\alpha_k \rho)$ and covariance $(1 + \alpha_1 \alpha_2)\rho - \alpha_1 - \alpha_2$.

[9] Note that the rejection of the hypothesis $\rho = 0$ means that system estimation is preferred above single equation regressions.

and 81% for Protestants and Catholics, respectively). In contrast, a majority of the people that are not raised in a religion becomes later on member of a church (53%). Figures for the Netherlands are in accordance with this observation (Becker and De Wit, 2000).[10] While membership did not change much between 1991 (43%) and 1999 (37%), religious participation (defined as the share of members attending services at least once a week) dramatically decreased with 26%. This is especially the case for Roman Catholics, where this share decreases with 53% to a level of 14% in 1999.[11]

Furthermore, one can doubt the quality of the answers on the membership question because official but inactive members, who are a large part of total members, might answer this question arbitrarily with yes or no. Answers on questions about participation are considered to be more precise. We, therefore, believe that the participation variable is a more reliable measure of religiosity.

3 Data

Data are from 2000 for 27,908 Dutch households. These data are based on a survey of Statistics Netherlands (CBS), which gives according to the CBS, a reliable picture of the total Dutch population. In this survey households are questioned about socio-economic characteristics (like age, education level and composition of households), the level of after tax household income[12] and church membership. Households can choose between no membership of a denomination or membership of the following denominations: Roman Catholic, two types of Protestants (Reformed and 'Gereformeerd'), Islam and non-specified other denominations.[13] Furthermore, members of a denomination are asked how many times per year a service of the denomination is attended.[14]

[10] Our dataset contains no information about the religion a person was raised in.

[11] This is in line with the conclusion of Iannaccone (1998, p. 1470) that the empirical literature shows that for religious membership 'income or wage effects are almost always dwarfed by those of age, gender, and religious upbringing.'

[12] We have no information on the wage rate or working time.

[13] The Reformed and 'Gereformeerde' Church are both Protestant churches. Although they look alike in some places, the differences are large in other places (Orthodox Protestants are included in the dummy for the Reformed Church). Tests show that it is not allowed to combine them in one Protestant dummy. Reformed households are taken as benchmark in the estimation. Thus, for this religion the dummy is excluded.

[14] The frequency of church attendance is not reported for individual family members.

Table 2: Descriptive statistics income and socio-economic characteristics

	Sample members				Full sample			
	Ave.	St. dev	Max.	Min.	Ave.	St. dev	Max.	Min.
Income (decile)	5.43	2.81	10	1	5.57	2.84	10	1
$\text{Member}_{Rom.Cat.}$	0.52	0.50	1	0	0.31	0.46	1	0
$\text{Member}_{Reform.}$	0.23	0.42	1	0	0.14	0.35	1	0
$\text{Member}_{Geref.}$	0.12	0.32	1	0	0.08	0.25	1	0
Member_{Islam}	0.04	0.20	1	0	0.02	0.15	1	0
Member_{Other}	0.09	0.28	1	0	0.05	0.22	1	0
Age	49.42	15.35	85	15	47.57	14.97	85	15
Male	0.82	0.38	1	0	0.81	0.39	1	0
Size household	2.91	1.38	6	1	2.86	1.34	6	1
$\text{Child}_{<4\ years}$	0.16	0.37	1	0	0.17	0.37	1	0
$\text{Child}_{4-12\ years}$	0.16	0.36	1	0	0.16	0.37	1	0
$\text{Child}_{12-18\ years}$	0.11	0.31	1	0	0.10	0.31	1	0
Single household	0.18	0.38	1	0	0.19	0.39	1	0
Education_{low}	0.06	0.24	1	0	0.06	0.24	1	0
Education_{mid}	0.34	0.47	1	0	0.34	0.47	1	0
Education_{high}	0.22	0.41	1	0	0.25	0.43	1	0
Dutch	0.97	0.18	1	0	0.97	0.16	1	0
Density index	3.25	1.25	5	1	3.08	1.29	5	1

Our estimations are based on two different datasets (Table 2). The full dataset (27,908 observations) is used to estimate the system with membership as endogenous variable. As here religion is defined as membership of a church, we include observations for church members (16,758) as well as for 'pagans' (11,150). These last observations are excluded in the second system estimation with participation as endogenous variable as 'pagans' have a zero participation by definition. Since the 'pagan' dummy would be perfectly correlated with participation (=0), estimation of the corresponding coefficient in the first equation is impossible. Estimation of the income equation would suffer from multicollinearity for the same reason.

In total 16,758 respondents are member of some denomination (see Table 3). This is 60% of all households which is comparable with the USA according to Iannaccone (1994). Roman Catholic membership applies for 52% of total members, while 36% are member of a Protestant church. Finally, 4% are member of the Islam and 9% of some non-specified religious membership.

Table 3: Descriptive statistics: number of denomination members

		Participation: services are attended at least per year				
Membership	All	52	24	12	< 12	≈ 0
Roman Catholic	8,655	882	641	1,043	1,979	4,110
Reformed	4,041	860	376	287	502	2,016
'Gereformeerd'	1,944	951	259	134	167	433
Islam	678	212	35	35	78	318
Other	1,440	608	131	74	138	489
Total	16,758	3,513	1,442	1,573	2,864	7,366

Comparing the number of church members who do seldom or never attend services (7,366) with total membership of the denomination makes clear that a large part is not religious active. While this comprehends 44% of total church members, the differences between denominations are large with members of the Roman Catholic, Reformed and Islam with lowest participation levels. Only 21% of church members visit often (once or more per week) a church service. This is, according to Iannaccone et al (1997), somewhat lower than in Canada and much lower than in the USA. Countries like Switzerland, Australia, Germany, New Zealand and the UK have a somewhat lower attendance rate, while especially Scandinavian countries (Sweden, Norway, Finland and Denmark) have a very low religious participation rate (less than 10%). In our estimations the participation dummy is based on the category of most frequent church visits.[15]

Table 4 gives more information on the income deciles. Although we only have information in which decile households are, average and maximum decile figures in euros are available. The average income for our sample is 24,800 euro per year. The distribution of households over the deciles is quite equal with a minimum of 2,508 and a maximum of 2,872 households per decile. We also included the number of 'pagan' households per decile (column with Membership=0) and the number of households who are church member (Membership=1), divided in members who participate less than once a weak (Part=0) and members who participate at least once a weak (Part=1).

[15]Our results do not depend on this definition. When participation is defined as church attendance for at least two times per month results are comparable. See Appendix B. In another alternative, we treat households that

Table 4: Income deciles

Deciles Income	Number of households Membership=1 Part=1	Part=0	Member-ship=0	Total	Income in Euro per year Average	Maximum
1	357	1,137	1,014	2,508	4,900	10,000
2	465	1,315	897	2,677	11,500	12,900
3	502	1,296	1,018	2,816	14,300	15,700
4	416	1,348	1,082	2,846	17,100	18,700
5	386	1,372	1,095	2,853	20,500	22,200
6	320	1,397	1,155	2,872	24,100	25,900
7	308	1,386	1,178	2,872	27,900	29,900
8	276	1,408	1,150	2,834	32,400	35,100
9	275	1,309	1,252	2,836	38,700	43,200
10	208	1,277	1,309	2,794	56,500	na
Total	3,513	13,245	11,150	27,908		

Data are available for the most important socio-economic characteristics (see Appendix D for definitions). For most characteristics information is expressed as a dummy variable. Exceptions are age (available for the breadwinner and included in years and its square), household size (the number of persons per household)[16] and population density (ordered with value 1 for a densely populated area and 5 for a sparsely populated country village). Dummies are available for the three types of family composition (benchmark are households with two adults and no children or children older than 18 years), three education levels (benchmark is household with lowest education level) and for a breadwinner with the Dutch nationality (benchmark is a household who has no Dutch nationality).

4 Results

First we discuss the estimation results for the bicausal relation between religious membership and income. The second subsection presents the results for religious participation. The third subsection discusses results for the socio-economic characteristics.

never attend services as a non-church member. Also this reclassification hardly affects our conclusions.

[16] Statistics Netherlands do not report data for households consisting of more than 6 persons for privacy reasons.

4.1 Membership and income

Table 5 presents the estimation results for religion defined as membership of a denomination. In panel A the results are included for the membership equation, while in panel B the results are shown for the income equation. Columns two and three present the structural coefficients and the standard errors, while in the fourth column marginal effects are included.[17] The system results can be compared with the results for the single equation estimations, presented in the last two columns. The choice of the identifying restrictions is motivated by the single equation results. In the system estimation, the Male dummy is excluded from the membership equation, while the Child_{12-18} dummy is dropped from the income equation.[18]

A first finding is that ρ is significant (at 1%).[19] The results of the system estimation are therefore preferred above the single equation estimations. The single equation approach results in highly significant, negative cross-effects between membership and income. The significant bicausal relation is not longer found with the more efficient simultaneous estimation. The structural estimates show that for given socio-economic variables income has no effect on membership. The negative coefficient in the single membership equation incorrectly identifies part of the non-income effects as pure income effects. A similar interpretation holds for the income equation. As bicausality is strongly rejected, the change in estimated values arises from using that disturbance terms are correlated.

In contrast, Lipford and Tollison (2003) found that system estimation did not change the significant, negative effect of income on membership, but that the negative coefficient for the opposite effect doubled. The negative relation between membership and income in both directions is not found for our dataset.

[17] Marginal effects on income are calculated in euros using the average income per decile from Table 4 and expressed as a % of the sample average income. The marginal effects of age are multiplied by its standard deviation (=15) for a better scaling. See Appendix C for details on the computation and for individual decile effects.

[18] Sensitivity analysis with other restrictions show that our main conclusions do not depend on this choice. Alternative identifying restrictions are motivated by the significance level or the magnitude of marginal effects in the single equation estimation. Results are available upon request.

[19] For both the membership and participation estimations this result is confirmed by a loglikelihood ratio test.

Table 5: Estimation results religious membership

	Structural System			Single	
	Coeff.	St. error	Marg.[1]	Coeff.	St. error
A. Membership					
Income	0.245	(0.548)	8.99	-0.015***	(0.003)
Age	-0.032	(0.039)	6.25	-0.012***	(0.004)
Age^2	0.000	(0.000)		0.000***	(0.000)
Male	(-)		(-)	0.012	(0.024)
Size household	0.174***	(0.042)	6.21	0.153***	(0.012)
$Child_{<4\ years}$	-0.156***	(0.053)	-5.65	-0.135***	(0.032)
$Child_{4-12\ years}$	-0.270***	(0.065)	-9.84	-0.242***	(0.033)
$Child_{12-18\ years}$	-0.193***	(0.036)	-7.03	-0.200***	(0.033)
Single household	0.407	(0.701)	13.50	0.056*	(0.029)
$Education_{low}$	-0.169	(0.189)	-6.08	-0.073**	(0.034)
$Education_{mid}$	-0.172	(0.253)	-6.19	-0.043**	(0.020)
$Education_{high}$	-0.445	(0.569)	-16.47	-0.154***	(0.022)
Dutch	-0.710***	(0.175)	-22.62	-0.625***	(0.053)
Density	0.152***	(0.006)	5.45	0.153***	(0.006)
B. Income					
Membership	0.117	(0.120)	5.20	-0.058***	(0.013)
Age	0.071***	(0.004)	-1.00	0.070***	(0.003)
Age^2	-0.001***	(0.000)		-0.001***	(0.000)
Male	0.042**	(0.018)	1.88	0.044**	(0.019)
Size household	-0.092***	(0.016)	-4.02	-0.070***	(0.009)
$Child_{<4\ years}$	0.093***	(0.023)	4.43	0.074***	(0.025)
$Child_{4-12\ years}$	0.132***	(0.026)	6.29	0.098***	(0.026)
$Child_{12-18\ years}$	(-)		(-)	-0.027	(0.026)
Single household	-1.268***	(0.023)	-49.82	-1.255***	(0.022)
$Education_{low}$	0.353***	(0.029)	14.67	0.341***	(0.027)
$Education_{mid}$	0.467***	(0.017)	19.78	0.459***	(0.015)
$Education_{high}$	1.061***	(0.028)	48.56	1.035***	(0.017)
Dutch	0.379***	(0.085)	16.06	0.292***	(0.039)
Density	-0.016	(0.019)	-0.69	0.005	(0.005)
Rho	-0.036***	(0.008)		0	
LogL	-76,675			-76,665	
Observations	27,908			27,908	

1. Marginal effects in %-point change of base value for Membership (60.34%) and % change of base value for Income (24.8 thousand euro).

Coefficients with */**/*** are significant at the 10%/5%/1% level.

4.2 Participation and income

Table 6 presents the estimation results for religious participation. The identifying restrictions are the same as in the first system (with membership as religious measure). Again, ρ is significant. With single equation estimation, the coefficient for the effect of income on participation as well as the coefficient for the opposite effect are significantly negative. However, estimating a system yields again insignificant cross-effects, suggesting that households who attend church services frequently do not have a significant lower income. Concerning the reverse effect, Iannaccone (1998) report that most studies find that income is a weak predictor of church attendance.

Interestingly, we find an effect of Islamic membership on income after controlling for religious participation. Compared with the benchmark (a Reformed household), Islamic households earn less (-25%). As we also correct for differences in education and nationality, Islamic households apparently hang back with respect to income. This effect is in accordance with results found by Barro and McCleary (2003), although our effects are much larger. The insignificant effect of Catholic membership on income is in line with Cornwell et al. (2003). However, Heath et al. (1995) found a negative effect and Steen (1996) found a positive effect for this variable.

Summarizing, our analysis shows that estimating a single equation may lead to erroneous conclusions about the effect of religion on income. Clearly, the conclusion of Lipford and Tollison (2003) and Barro and McCleary (2003) can not be confirmed for our data as in their cases the effect remains significantly negative after correcting for endogeneity. The significant effects found in Cornwell et al. (2003) and Steen (1996) might be misleading since they follow the single equation approach.

4.3 Effects of socio-economic characteristics

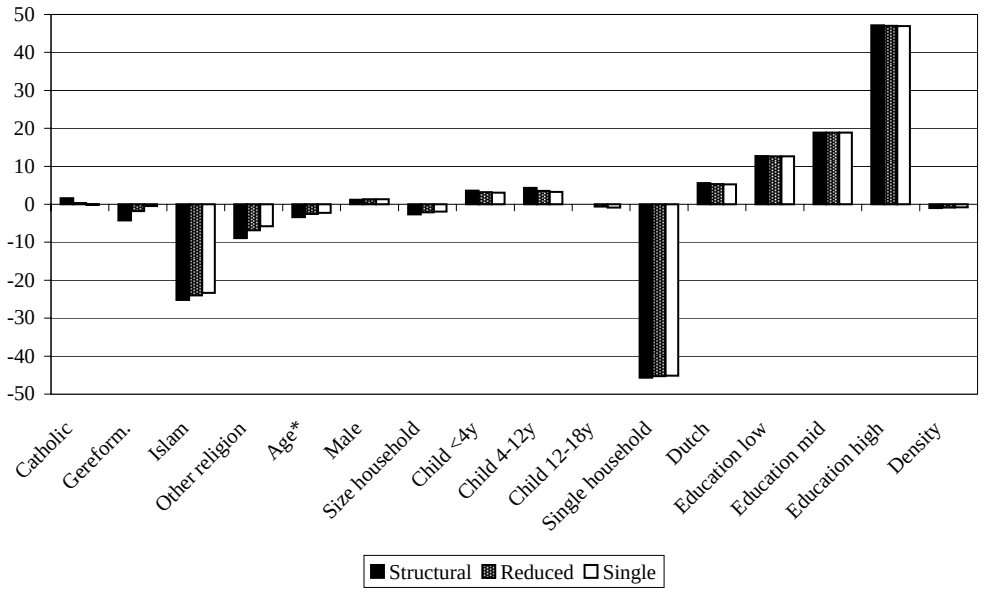
In contrast to the former findings, system estimation hardly affects the coefficients representing effects of socio-economic characteristics. This is illustrated by way of the marginal effects calculated

Table 6: Estimation results participation (once or more per week)

	Structural System			Single	
	Coeff.	St. error	Marg.[1]	Coeff.	St. error
A. Participation					
Income	1.475	(1.859)	35.51	-0.030***	(0.005)
$\text{Member}_{Catholic}$	-0.450***	(0.045)	-9.20	-0.440***	(0.030)
$\text{Member}_{Gereform.}$	0.908***	(0.095)	29.54	0.846***	(0.037)
Member_{Islam}	1.393	(1.111)	47.04	0.473***	(0.067)
Member_{Other}	0.971***	(0.306)	31.87	0.726***	(0.042)
Age	-0.106	(0.105)	12.89	-0.019***	(0.006)
Age^2	0.001	(0.001)		0.000***	(0.000)
Male	(-)		(-)	0.046	(0.041)
Size household	0.256***	(0.094)	6.67	0.181***	(0.016)
$\text{Child}_{<4\ years}$	-0.215	(0.149)	-4.35	-0.110**	(0.054)
$\text{Child}_{4-12\ years}$	-0.351**	(0.160)	-6.76	-0.234***	(0.053)
$\text{Child}_{12-18\ years}$	-0.179**	(0.077)	-3.67	-0.199***	(0.051)
Single household	1.927	(2.224)	52.58	0.112**	(0.046)
Education_{low}	-0.467	(0.581)	-12.73	0.014	(0.051)
Education_{mid}	-0.671	(0.849)	-17.48	0.032	(0.030)
Education_{high}	-1.573	(1.943)	-31.74	0.039	(0.036)
Dutch	-0.277	(0.250)	-7.23	-0.085	(0.070)
Density	0.075*	(0.039)	1.85	0.045***	(0.010)
B. Income					
Part	0.068	(0.156)	2.95	-0.109***	(0.021)
$\text{Member}_{Catholic}$	0.037	(0.071)	1.62	-0.003	(0.020)
$\text{Member}_{Gereform.}$	-0.099	(0.135)	-4.28	-0.010	(0.029)
Member_{Islam}	-0.631***	(0.095)	-25.21	-0.581***	(0.050)
Member_{Other}	-0.210*	(0.119)	-8.94	-0.135***	(0.032)
Age	0.058***	(0.005)	-3.38	0.055***	(0.004)
Age^2	-0.001***	(0.000)		-0.001***	(0.000)
Male	0.027	(0.026)	1.17	0.032	(0.026)
Size household	-0.062**	(0.024)	-2.65	-0.044***	(0.011)
$\text{Child}_{<4\ years}$	0.077**	(0.030)	3.57	0.067**	(0.034)
$\text{Child}_{4-12\ years}$	0.093***	(0.034)	4.30	0.071**	(0.034)
$\text{Child}_{12-18\ years}$	(-)		(-)	-0.019	(0.034)
Single household	-1.192***	(0.039)	-45.65	-1.175***	(0.030)
Education_{low}	0.312***	(0.035)	12.67	0.311***	(0.034)
Education_{mid}	0.454***	(0.020)	18.90	0.455***	(0.019)
Education_{high}	1.046***	(0.023)	47.12	1.043***	(0.023)
Dutch	0.131**	(0.051)	5.58	0.123**	(0.050)
Density	-0.023**	(0.010)	-0.98	-0.018***	(0.007)
Rho	-0.067***	(0.012)		0	
LogL	-42,547			-42,532	
Observations	16,758			16,758	

1. Marginal effects in %-point change of base value for Part (20.83%) and % change of base value for Income (24.8 thousand euro).

Figure 1: Marginal effects of Income equation for Participation case (% of average income)

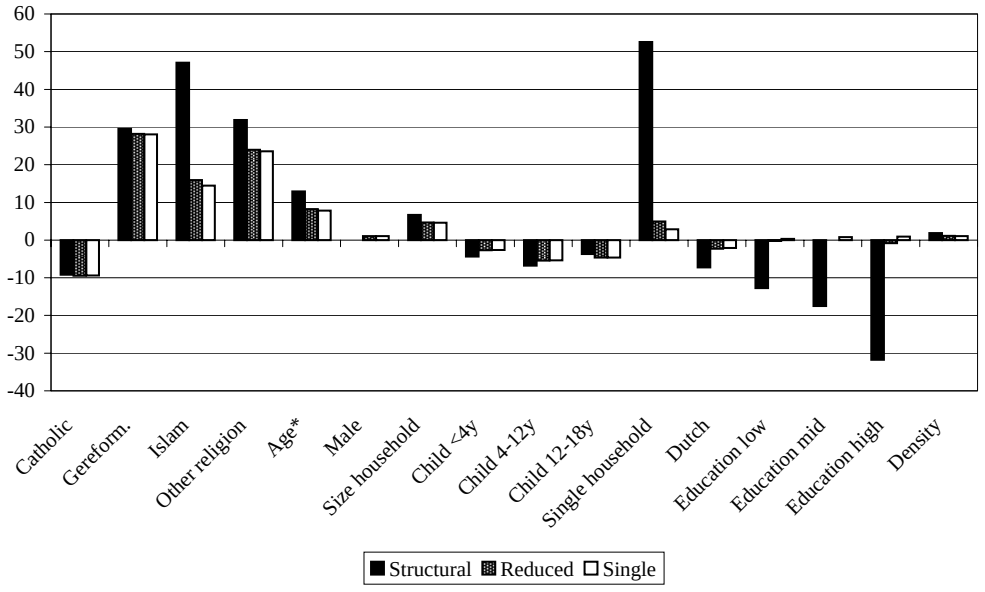


for the case with religious participation (Figure 1 and 2)[20] Two features are observed. First, the marginal effects obtained for the structural system do hardly differ from the ones of the reduced system (if the corresponding coefficient is significantly estimated). In other words, the direct effect of the socio-economic characteristics dominates the indirect effects for both endogenous variables. Second, system estimation yields effects comparable to single equation estimation. In the following we discuss in detail the structural coefficients of the socio-economic variables.

The effects of socio-economic control variables on *income* are in general as expected (see Panel B in Table 5 and 6). Income increases with the level of education and the age profile is hump-shaped (with a peak at 46 and 44 years, respectively). Households with a male breadwinner have higher income levels (only significant in Table 5). Larger households have a lower level of income, although there is some indication that households with young children earn more. Single households earn less than households with two grown-ups without children (remember that our endogenous variable is household income). Finally, there is some indication that Dutch households earn more than households who are born outside the Netherlands and that households who live in

[20] The calculation and detailed results of the marginal effects can be found in Appendix C.

Figure 2: Marginal effects of Participation equation (%)



more densely populated areas have a higher income.

The marginal effects on income are modest for most variables, except for single households and education level. According to Table 6, single households earn 46% less than households with two grown-ups, while a high education level increases income with 47%.

More interesting are the effects of socio-economic variables on the *religious variables* (see Panel A). While Roman Catholic households have a lower religious participation compared with Reformed households (-9%, see Table 6), the 'Gereformeerden' and other church members show a higher religious participation (30% and 32%, respectively). As the first effect is certainly not in accordance with Barro and McCleary (2003), who find a higher church attendance for the Roman Catholics compared with Protestants, the situation in the Netherlands seems to be different from other countries. This stresses the point that the dominance of empirical studies based on data for Canada and the USA might be misleading. Furthermore, it questions the soundness of cross-country estimations like that of Barro and McCleary (2003) as members of the same religion might behave differently between countries.

The relation between age and religious variables is U-shaped. Where both religious variables first fall with age, they rise for higher ages. The turning-point is higher for religious participation (39 years) than for membership (34 years). The negative effect is larger for young households with young children as the coefficients for the Child dummies are significantly negative (except for $\text{Child}_{<4\,years}$ in Table 6). This conflicts with the results of Barro and McCleary (2003) as they find a positive effect for the share of population younger than 15 on church attendance and an insignificant effect for the share of people older than 65.

The size of the household has positive effects. Larger households are more often member of a church while they also have a larger religious participation. This effect is, however, slowed down when young children are present. The marginal effects on church membership in Table 5 show that the net effect, when we increase the household size with one and assume that this increases stems from an extra child, is even negative when the youngest child is between 4 and 18 years old. Single households do not attend services more often, nor are they more frequently church member.

None of the education dummies have significant effects on membership and participation. Barro and McCleary (2003) find that higher education levels lead to lower levels of church membership and more religious participation. This suggests that households with a higher education more often choose to leave the church, but also intensify their religious behavior when they decide to stay (see Sacerdote and Glaeser, 2001). This outcome is not found for the Netherlands.

Dutch households are less often member of a church (note that the marginal effect is -23%), although Dutch members attend services as often as households born in other countries. Finally, households living in less densely populated areas participate more and are also more often member of a church.

5 Conclusions

This paper focuses on the estimation of the effect of religion on income, using a large micro-dataset for the Netherlands. Religion is captured by two measures: church membership and attendance. We find that the estimates of the cross-effects following the single equation approach strongly differ from the ones obtained with the more efficient system approach.

When religiosity is measured by membership, we find with the single equation approach that membership decreases significantly the income level and that income has a negative effect on membership. However, both coefficients get insignificant with simultaneous estimation. The bicausal relation is also rejected when religion is measured by church attendance (for the subset of church members). In contrast, the effects of the socio-economic characteristics on religion and income hardly differ between both estimation approaches.

The conclusion that religion does not affect income, when properly estimated, might be specific for the Dutch situation. For future research we plan to investigate with micro-datasets whether the impact of religious behavior differs between countries.

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Appendix A System estimation[21]

The probability that $y_{1i} = 1$ and $y_{2i} = j$ for observation i is given by

$$\begin{aligned}
\Pr(y_{1i} = 1, y_{2i} = j) &= \Pr(y_{1i}^* > 0,\, \mu_{j-1} < y_{2i}^* \leq \mu_j) \\
&= \Pr(v_{1i} > -\bar{\beta}_1' x_i,\, \mu_{j-1} - \bar{\beta}_2' x_i < v_{2i} \leq \mu_j - \bar{\beta}_2' x_i) \\
&= \Pr(v_{1i} > -\bar{\beta}_1' x_i,\, v_{2i} \leq \mu_j - \bar{\beta}_2' x_i) - \\
&\quad \Pr(v_{1i} > -\bar{\beta}_1' x_i,\, v_{2i} \leq \mu_{j-1} - \bar{\beta}_2' x_i) \\
&= \Phi_2(\bar{\beta}_1' x_i,\, \mu_j - \bar{\beta}_2' x_i,\, -\rho) - \Phi_2(\bar{\beta}_1' x_i,\, \mu_{j-1} - \bar{\beta}_2' x_i,\, -\rho) \qquad \text{(A.1)}
\end{aligned}$$

where $\Phi_2(a, b, \rho)$ is the cumulative unit bivariate normal distribution with correlation coefficient ρ evaluated at cutoff points a and b. Notice that for the two outside classes ($j = 1$ or $j = J$), the expression simplifies to

$$\begin{aligned}
\Pr(y_{1i} &= 1, y_{2i} = 1) = \Phi_2(\bar{\beta}_1' x_i,\, \mu_1 - \bar{\beta}_2' x_i,\, -\rho) \\
\Pr(y_{1i} &= 1, y_{2i} = J) = \Phi(\bar{\beta}_1' x_i) - \Phi_2(\bar{\beta}_1' x_i,\, \mu_{J-1} - \bar{\beta}_2' x_i,\, -\rho)
\end{aligned}$$

where Φ denotes the univariate standard normal cdf. Analogously, the probability that $y_{1i} = 0$ and $y_{2i} = j$ is given by

$$\Pr(y_{1i} = 0, y_{2i} = j) = \Phi_2(-\bar{\beta}_1' x_i,\, \mu_j - \bar{\beta}_2' x_i,\, \rho) - \Phi_2(-\bar{\beta}_1' x_i,\, \mu_{j-1} - \bar{\beta}_2' x_i,\, \rho) \qquad \text{(A.2)}$$

The log likelihood function over all observations is obtained by combining the logarithms of the probabilities (A.1) and (A.2):

[21] This appendix is based on Hall et al. (2000, Appendix B), Greene (1997) and Maddala (1983).

$$\ln L = \sum_{i=1}^{N} \sum_{j=1}^{J} \{I(y_{1i} = 1, y_{2i} = j) \ln \Pr(y_{1i} = 1, y_{2i} = j) + I(y_{1i} = 0, y_{2i} = j) \ln \Pr(y_{1i} = 0, y_{2i} = j)\} \tag{A.3}$$

where I indicates a dummy variable that equals one when observation i matches the combination of y_1 and y_2. Maximizing (A.3) gives the estimates of the structural coefficients (α_k, β_k), the cutoff points (μ_j) and the correlation ρ.

Notice that in the special case with $\rho = 0$, the bivariate system separates into the binary Probit and the ordered Probit since $\Phi_2(a, b, 0) = \Phi(a)\Phi(b)$. The log likelihood (A.3) simplifies to the sum of the log likelihood functions of the single equations.

Appendix B Alternative specification participation

Table B.1: Estimation results participation is at least two times per month

	Structural System			Single	
	Coeff.	St. error	Marg.[1]	Coeff.	St. error
A. Participation					
Income	0.457	(1.289)	13.56	-0.021***	(0.005)
$\text{Member}_{Catholic}$	-0.384***	(0.030)	-10.92	-0.380***	(0.027)
$\text{Member}_{Gereform.}$	0.901***	(0.066)	32.75	0.881***	(0.036)
Member_{Islam}	0.663	(0.770)	23.90	0.362***	(0.064)
Member_{Other}	0.731***	(0.212)	26.44	0.650***	(0.040)
Age	-0.041	(0.073)	11.01	-0.013**	(0.005)
Age^2	0.001	(0.001)		0.000***	(0.000)
Male	(-)		(-)	0.015	(0.037)
Size household	0.176***	(0.065)	5.42	0.152***	(0.015)
$\text{Child}_{<4\ years}$	-0.085	(0.104)	-2.37	-0.051	(0.048)
$\text{Child}_{4-12\ years}$	-0.122	(0.111)	-3.36	-0.084*	(0.048)
$\text{Child}_{12-18\ years}$	-0.114**	(0.054)	-3.15	-0.120**	(0.047)
Single household	0.662	(1.544)	21.13	0.069	(0.043)
Education_{low}	-0.098	(0.403)	-3.02	-0.035	(0.066)
Education_{mid}	-0.179	(0.587)	-5.42	0.060	(0.047)
Education_{high}	-0.410	(1.346)	-11.76	0.052*	(0.027)
Dutch	-0.097	(0.171)	-2.94	0.117***	(0.032)
Density	0.063**	(0.027)	1.89	0.053***	(0.009)
B. Income					
Part	0.111	(0.260)	4.81	-0.076***	(0.019)
$\text{Member}_{Catholic}$	0.049	(0.101)	2.17	-0.001	(0.020)
$\text{Member}_{Gereform.}$	-0.139	(0.231)	-5.99	-0.017	(0.029)
Member_{Islam}	-0.640***	(0.114)	-25.52	-0.587***	(0.050)
Member_{Other}	-0.233	(0.174)	-9.89	-0.142***	(0.032)
Age	0.058***	(0.006)	-3.93	0.056***	(0.004)
Age^2	-0.001***	(0.000)		-0.001***	(0.000)
Male	0.029	(0.026)	1.24	0.031	(0.026)
Size household	-0.066*	(0.035)	-2.85	-0.046***	(0.011)
$\text{Child}_{<4\ years}$	0.076**	(0.030)	3.50	0.068**	(0.034)
$\text{Child}_{4-12\ years}$	0.086***	(0.029)	4.00	0.075**	(0.034)
$\text{Child}_{12-18\ years}$	(-)		(-)	-0.016	(0.034)
Single household	-1.193***	(0.040)	-45.70	-1.177***	(0.030)
Education_{low}	0.306***	(0.037)	12.46	0.124**	(0.050)
Education_{mid}	0.451***	(0.022)	18.78	0.312***	(0.034)
Education_{high}	1.036***	(0.028)	46.67	0.455***	(0.019)
Dutch	0.129**	(0.050)	5.49	1.045***	(0.023)
Density	-0.025	(0.016)	-1.10	-0.018***	(0.007)
Rho	-0.047***	(0.011)		0	
LogL	-44,122			-44,114	
Observations	16,758			16,758	

1. Marginal effects in %-point change of base value for Part (29.42%) and % change of base value for Income (24.8 thousand euro).
Coefficients with */**/*** are significant at the 10%/5%/1% level.

Appendix C Marginal effects

Marginal effects are calculated for the unconditional mean functions of the structural (2.1), the reduced (2.2) and the single equations (see Greene, 1997, p. 910). The structural equations (2.1) are evaluated after substituting $u_k = v_k - \alpha_k v_{k'}$ $(k \neq k')$ and (2.2):

$$y^*_{ki} = \alpha_k \hat{y}^*_{k'i} + \beta'_k x_{ki} + v_{ki} \qquad \text{with } \hat{y}^*_{ki} = \bar{\beta}'_k x_i$$

Discrete variables. The 'marginal' effects of dummy variables in the reduced form equations are computed as:

$$\frac{\Delta Pr(y_{1i}=1)}{\Delta x_i(l)} = \Phi\left(\bar{\beta}'_1 x_i \,|\, x_i(l)=1\right) - \Phi\left(\bar{\beta}'_1 x_i \,|\, x_i(l)=0\right) \tag{C.1}$$

$$\frac{\Delta Pr(y_{2i}=j)}{\Delta x_i(l)} = \left[\Phi\left(\mu_j - \bar{\beta}'_2 x_i \,|\, x_i(l)=1\right) - \Phi\left(\mu_{j-1} - \bar{\beta}'_2 x_i \,|\, x_i(l)=1\right)\right] - \left[\Phi\left(\mu_j - \bar{\beta}'_2 x_i \,|\, x_i(l)=0\right) - \Phi\left(\mu_{j-1} - \bar{\beta}'_2 x_i \,|\, x_i(l)=0\right)\right] \tag{C.2}$$

where Φ is the normal cumulative distribution function. Similar expressions hold for the structural and single equations. If dummies are exclusive, the competing dummies are set to zero. For example, when the marginal effect of Roman Catholic membership is calculated, all other membership dummies are set to zero. This procedure applies also to the education dummies and the single household/child dummies. The index variables 'Size household' and 'Density' are increased by one scale to evaluate the marginal effects.

Continuous variables. Continuous variables include Age for all equations and the latent variables in the structural equations. Marginal effects for the reduced form equations are calculated

using:

$$\frac{\partial Pr(y_{1i}=1)}{\partial x_i(l)} = \phi\left(\bar{\beta}_1' x_i\right)\bar{\beta}_1(l) \tag{C.3}$$

$$\frac{\partial Pr(y_{2i}=j)}{\partial x_i(l)} = -\left[\phi\left(\mu_j - \bar{\beta}_2' x_i\right) - \phi\left(\mu_{j-1} - \bar{\beta}_2' x_i\right)\right]\bar{\beta}_2(l) \tag{C.4}$$

where ϕ is the standard normal density function.[22] Similar expressions hold for the structural and single equations.

Reported marginal effects. The sample average of the individual marginal effects is reported. Marginal effects obtained for the income equation are converted into the expected income change, relative to the sample average income:

$$\frac{\sum_{i=1}^{N}\sum_{j=1}^{J}\bar{Y}_j\frac{\Delta Pr(y_{2i}=j)}{\Delta x_i(l)}}{N\,\bar{Y}} \tag{C.5}$$

where $\bar{Y}_j$ denotes the average income in class j and $\bar{Y}$ the sample average income.

The structure of the following, detailed Tables is as follows:

- In the first 10 columns, the first line gives the average probability for each income decile (%). The remaining lines give the marginal effects on the probabilities (%). The marginal effects of age are multiplied by its standard deviation (=15) for a better scaling.
- The first entry in the column labelled 'Income' is the sample average income $\bar{Y}$ (in 1000 euro). The other entries give the marginal change in the income level as a % of $\bar{Y}$, calculated using (C.5).
- The last column, labelled 'Reli' or 'Part', gives the average probability and the marginal effects for the religion equation (%).

[22] Note that for simplicity the quadratic effect of age is not included in the formula. However, this effect is included in the reported marginal effects.

Table C.1: Marginal effects: religious membership (reduced form)

Decile income	1	2	3	4	5	6	7	8	9	10	Income	Reli.
average prob	9.19	8.65	9.97	10.49	10.63	10.66	10.60	10.27	9.96	9.58	24.80	59.73
marg. effects												
Age	1.12	-0.08	-0.25	-0.32	-0.32	-0.29	-0.21	-0.10	0.06	0.39	-0.12	6.23
Man	-0.55	-0.34	-0.28	-0.18	-0.08	0.03	0.14	0.25	0.39	0.63	1.93	0.39
Size housh.	0.94	0.57	0.47	0.30	0.12	-0.05	-0.24	-0.43	-0.65	-1.04	-3.23	5.58
$\text{Child}_{<4}$	-0.63	-0.66	-0.64	-0.49	-0.29	-0.06	0.19	0.45	0.77	1.36	3.67	-5.00
Child_{4-12}	-0.82	-0.88	-0.86	-0.66	-0.39	-0.09	0.24	0.59	1.03	1.85	4.92	-9.00
Child_{12-18}	0.20	0.21	0.19	0.14	0.08	0.01	-0.07	-0.14	-0.23	-0.39	-1.10	-7.31
Single househ.	24.42	11.44	5.94	1.07	-2.56	-5.22	-7.18	-8.48	-9.41	-10.03	-49.59	3.50
Dutch	-4.35	-2.45	-1.85	-1.06	-0.28	0.46	1.19	1.89	2.64	3.82	13.04	-20.66
Educ._{low}	-5.32	-3.13	-2.30	-1.17	-0.05	0.98	1.90	2.63	3.18	3.28	14.28	-3.12
Educ._{mid}	-6.73	-4.14	-3.17	-1.76	-0.31	1.08	2.36	3.45	4.37	4.83	19.51	-2.16
Educ._{high}	-11.36	-8.17	-7.26	-5.31	-2.89	-0.22	2.76	6.03	9.97	16.45	47.53	-7.04
Density	-0.03	-0.02	-0.01	-0.01	0.00	0.00	0.01	0.01	0.02	0.03	0.10	5.47

Table C.2: Marginal effects: religious membership (structural form)

Decile income	1	2	3	4	5	6	7	8	9	10	Income	Reli.
average prob	9.19	8.65	9.97	10.49	10.63	10.66	10.60	10.27	9.96	9.58	24.80	59.73
marg. effects												
Income												8.99
Membership	-1.45	-0.91	-0.75	-0.50	-0.23	0.05	0.35	0.66	1.04	1.73	5.20	
Age	1.41	0.07	-0.13	-0.25	-0.30	-0.31	-0.28	-0.22	-0.11	0.11	-1.00	6.25
Man	-0.53	-0.33	-0.27	-0.18	-0.08	0.03	0.13	0.24	0.38	0.62	1.88	
Size housh.	1.18	0.72	0.58	0.37	0.15	-0.07	-0.30	-0.54	-0.81	-1.29	-4.02	6.21
$\text{Child}_{<4}$	-0.75	-0.80	-0.78	-0.59	-0.35	-0.07	0.23	0.55	0.93	1.65	4.43	-5.65
Child_{4-12}	-1.03	-1.12	-1.10	-0.85	-0.51	-0.13	0.29	0.75	1.31	2.37	6.29	-9.84
Child_{12-18}												-7.03
Single househ.	24.96	11.48	5.85	0.92	-2.71	-5.35	-7.28	-8.52	-9.40	-9.94	-49.82	13.50
Dutch	-5.60	-3.06	-2.25	-1.24	-0.25	0.67	1.55	2.38	3.25	4.55	16.06	-22.62
Educ._{low}	-5.49	-3.23	-2.36	-1.19	-0.03	1.02	1.96	2.70	3.26	3.35	14.67	-6.08
Educ._{mid}	-6.87	-4.21	-3.20	-1.77	-0.29	1.12	2.41	3.51	4.43	4.87	19.78	-6.19
Educ._{high}	-11.59	-8.33	-7.40	-5.41	-2.96	-0.24	2.79	6.12	10.15	16.86	48.56	-16.47
Density	0.19	0.12	0.10	0.07	0.03	-0.01	-0.05	-0.09	-0.14	-0.23	-0.69	5.45

Table C.3: Marginal effects: religious membership (single equation)

Decile income	1	2	3	4	5	6	7	8	9	10	Income	Reli
average prob	9.09	8.60	9.93	10.47	10.63	10.67	10.62	10.31	10.02	9.66	24.80	60.33
marg. effects												
Income												-0.54
Membership	0.70	0.45	0.37	0.25	0.12	-0.02	-0.17	-0.32	-0.51	-0.86	-2.57	
Age	1.00	-0.13	-0.29	-0.34	-0.33	-0.27	-0.19	-0.06	0.12	0.48	0.19	6.49
Man	-0.55	-0.34	-0.28	-0.19	-0.08	0.02	0.14	0.25	0.39	0.64	1.95	0.44
Size housh.	0.89	0.55	0.45	0.29	0.12	-0.05	-0.22	-0.41	-0.62	-1.00	-3.09	5.47
$\text{Child}_{<4}$	-0.60	-0.64	-0.62	-0.48	-0.28	-0.06	0.18	0.43	0.74	1.32	3.54	-4.90
Child_{4-12}	-0.77	-0.83	-0.82	-0.63	-0.38	-0.09	0.22	0.56	0.98	1.76	4.67	-8.84
Child_{12-18}	0.24	0.24	0.23	0.17	0.09	0.01	-0.08	-0.17	-0.28	-0.46	-1.30	-7.28
Single househ.	24.19	11.47	6.03	1.17	-2.48	-5.16	-7.15	-8.48	-9.45	-10.14	-49.65	1.99
Dutch	-4.12	-2.35	-1.79	-1.04	-0.29	0.42	1.12	1.80	2.54	3.71	12.54	-20.18
Educ._{low}	-5.25	-3.12	-2.30	-1.18	-0.07	0.96	1.88	2.61	3.17	3.30	14.24	-2.66
Educ._{mid}	-6.66	-4.12	-3.17	-1.78	-0.33	1.05	2.34	3.44	4.38	4.87	19.51	-1.55
Educ._{high}	-11.23	-8.12	-7.25	-5.32	-2.93	-0.27	2.71	5.98	9.93	16.49	47.42	-5.67
Density	-0.07	-0.04	-0.04	-0.02	-0.01	0.00	0.02	0.03	0.05	0.08	0.24	5.44

Table C.4: Marginal effects: participation (reduced form)

Decile income	1	2	3	4	5	6	7	8	9	10	Income	Part
average prob	8.95	9.50	10.59	10.84	10.94	10.64	10.43	10.18	9.31	8.61	24.80	21.15
marg. effects												
$\text{Member}_{Catholic}$	-0.08	-0.06	-0.05	-0.03	-0.01	0.00	0.02	0.04	0.06	0.10	0.30	-9.49
$\text{Member}_{Gereform.}$	0.49	0.36	0.28	0.18	0.07	-0.04	-0.14	-0.26	-0.37	-0.57	-1.80	28.18
Member_{Islam}	9.41	5.33	3.37	1.41	-0.27	-1.67	-2.89	-4.02	-4.80	-5.87	-23.98	15.96
Member_{Other}	2.02	1.40	1.06	0.63	0.20	-0.21	-0.61	-1.03	-1.41	-2.06	-6.86	23.99
Age	1.90	0.46	0.10	-0.14	-0.30	-0.39	-0.45	-0.47	-0.42	-0.30	-2.52	8.24
Man	-0.37	-0.26	-0.20	-0.12	-0.04	0.03	0.11	0.19	0.26	0.41	1.30	1.06
Size housh.	0.62	0.42	0.32	0.19	0.07	-0.05	-0.18	-0.31	-0.43	-0.66	-2.12	4.67
$\text{Child}_{<4}$	-0.59	-0.66	-0.59	-0.42	-0.21	0.00	0.22	0.45	0.69	1.12	3.22	-2.68
Child_{4-12}	-0.64	-0.73	-0.65	-0.46	-0.24	0.00	0.23	0.50	0.76	1.23	3.55	-5.44
Child_{12-18}	0.12	0.13	0.11	0.08	0.04	0.00	-0.05	-0.09	-0.13	-0.21	-0.62	-4.61
Single househ.	22.30	11.61	5.53	0.68	-2.77	-5.14	-6.86	-8.12	-8.49	-8.73	-45.30	4.96
Dutch	-1.61	-1.08	-0.80	-0.47	-0.14	0.17	0.47	0.79	1.08	1.59	5.31	-2.31
Educ._{low}	-4.67	-3.14	-2.16	-0.99	0.09	1.03	1.83	2.49	2.79	2.73	12.65	-0.19
Educ._{mid}	-6.33	-4.49	-3.26	-1.70	-0.18	1.21	2.46	3.57	4.23	4.49	18.90	-0.01
Educ._{high}	-10.68	-8.92	-7.65	-5.39	-2.81	0.03	3.05	6.49	10.03	15.86	47.01	-0.82
Density	0.24	0.17	0.13	0.08	0.03	-0.02	-0.07	-0.12	-0.17	-0.26	-0.84	1.13

Table C.5: Marginal effects: participation (structural form)

Decile income	1	2	3	4	5	6	7	8	9	10	Income	Part
average prob	8.95	9.50	10.59	10.84	10.94	10.64	10.43	10.18	9.31	8.61	24.80	21.15
marg. effects												
Income												35.51
Part	-0.83	-0.58	-0.45	-0.28	-0.11	0.06	0.23	0.42	0.60	0.93	2.95	
$\text{Member}_{Catholic}$	-0.42	-0.31	-0.25	-0.16	-0.07	0.02	0.12	0.22	0.33	0.53	1.62	-9.20
$\text{Member}_{Gereform.}$	1.21	0.86	0.66	0.40	0.15	-0.11	-0.36	-0.63	-0.88	-1.32	-4.28	29.54
Member_{Islam}	10.17	5.63	3.49	1.39	-0.38	-1.85	-3.11	-4.25	-5.02	-6.06	-25.21	47.04
Member_{Other}	2.73	1.85	1.38	0.79	0.22	-0.32	-0.83	-1.36	-1.83	-2.62	-8.94	31.87
Age	2.20	0.62	0.21	-0.08	-0.28	-0.42	-0.53	-0.59	-0.59	-0.55	-3.38	12.89
Man	-0.33	-0.23	-0.18	-0.11	-0.04	0.03	0.09	0.17	0.24	0.37	1.17	
Size housh.	0.78	0.53	0.40	0.24	0.08	-0.07	-0.22	-0.38	-0.54	-0.81	-2.65	6.67
$\text{Child}_{<4}$	-0.65	-0.73	-0.66	-0.46	-0.24	0.00	0.24	0.50	0.76	1.24	3.57	-4.35
Child_{4-12}	-0.77	-0.88	-0.79	-0.56	-0.29	-0.01	0.28	0.60	0.92	1.50	4.30	-6.76
Child_{12-18}												-3.67
Single househ.	22.74	11.68	5.48	0.59	-2.89	-5.25	-6.95	-8.19	-8.52	-8.71	-45.65	52.58
Dutch	-1.70	-1.13	-0.84	-0.49	-0.15	0.18	0.50	0.83	1.14	1.66	5.58	-7.23
Educ._{low}	-4.68	-3.15	-2.16	-0.99	0.09	1.03	1.83	2.49	2.80	2.73	12.67	-12.73
Educ._{mid}	-6.33	-4.49	-3.26	-1.70	-0.18	1.21	2.46	3.57	4.23	4.49	18.90	-17.48
Educ._{high}	-10.70	-8.94	-7.67	-5.40	-2.82	0.02	3.05	6.50	10.05	15.90	47.12	-31.74
Density	0.28	0.19	0.15	0.09	0.03	-0.02	-0.08	-0.14	-0.20	-0.31	-0.98	1.85

Table C.6: Marginal effects: participation (single equation)

Decile income	1	2	3	4	5	6	7	8	9	10	Income	Part
average prob	9.01	9.53	10.61	10.85	10.94	10.63	10.41	10.16	9.28	8.57	24.80	20.87
marg. effects												
Income												-0.71
Part	1.38	0.93	0.71	0.42	0.14	-0.13	-0.40	-0.68	-0.95	-1.42	-4.67	
$\text{Member}_{Catholic}$	0.03	0.02	0.02	0.01	0.00	0.00	-0.01	-0.02	-0.02	-0.04	-0.12	-9.40
$\text{Member}_{Gereform.}$	0.12	0.09	0.07	0.04	0.02	-0.01	-0.03	-0.06	-0.09	-0.14	-0.45	28.03
Member_{Islam}	9.14	5.18	3.29	1.39	-0.24	-1.62	-2.81	-3.91	-4.68	-5.74	-23.36	14.45
Member_{Other}	1.69	1.17	0.89	0.53	0.18	-0.17	-0.50	-0.86	-1.19	-1.75	-5.78	23.53
Age	1.83	0.41	0.06	-0.16	-0.30	-0.38	-0.43	-0.43	-0.37	-0.23	-2.29	7.80
Man	-0.39	-0.27	-0.21	-0.13	-0.05	0.03	0.11	0.19	0.28	0.42	1.36	1.08
Size housh.	0.55	0.38	0.29	0.17	0.06	-0.05	-0.16	-0.27	-0.39	-0.59	-1.90	4.58
$\text{Child}_{<4}$	-0.56	-0.63	-0.56	-0.39	-0.20	0.00	0.21	0.43	0.66	1.06	3.07	-2.62
Child_{4-12}	-0.60	-0.67	-0.60	-0.42	-0.22	0.00	0.22	0.46	0.70	1.13	3.26	-5.37
Child_{12-18}	0.17	0.18	0.16	0.11	0.05	-0.01	-0.06	-0.12	-0.18	-0.28	-0.85	-4.61
Single househ.	22.20	11.55	5.51	0.69	-2.76	-5.12	-6.83	-8.09	-8.46	-8.69	-45.12	2.87
Dutch	-1.59	-1.06	-0.79	-0.46	-0.14	0.17	0.46	0.78	1.06	1.56	5.22	-2.09
Educ._{low}	-4.68	-3.13	-2.14	-0.98	0.10	1.03	1.83	2.48	2.78	2.71	12.62	0.34
Educ._{mid}	-6.35	-4.49	-3.25	-1.68	-0.17	1.22	2.46	3.57	4.22	4.47	18.88	0.76
Educ._{high}	-10.73	-8.92	-7.63	-5.35	-2.78	0.06	3.07	6.50	10.01	15.78	46.92	0.92
Density	0.23	0.15	0.12	0.07	0.03	-0.02	-0.06	-0.11	-0.16	-0.25	-0.79	1.09

Appendix D List of variables

Income (decile)	Decile of household income (deciles based on equal number of households per class)
Membership	Dummy = 1 for membership of a church
$\text{Member}_{Catholic}$	Dummy = 1 for membership of Roman Catholic church
$\text{Member}_{Reformed}$	Dummy = 1 for membership of Reformed church
$\text{Member}_{Gereform.}$	Dummy = 1 for membership of 'Gereformeerde' church
Member_{Islam}	Dummy = 1 for membership of Islam
Member_{Other}	Dummy = 1 for membership of some other church
Part	Dummy =1 if service is attended once or more per week
Age	Age of breadwinner
Male	Dummy with value =1 if breadwinner is male
Size household	Number of persons in household
$\text{Child}_{<4\ years}$	Dummy = 1 when youngest child is between 0 and 4
$\text{Child}_{4-12\ years}$	Dummy = 1 when youngest child is between 4 and 12
$\text{Child}_{12-18\ years}$	Dummy = 1 when youngest child is between 12 and 18
Single household	Household has only one grown-up
Education_{low}	Breadwinner has education at junior general secondary level
Education_{mid}	Breadwinner has education at senior or pre-university general secondary level or at vocational secondary level
Education_{high}	Breadwinner has education at higher professional or university level
Dutch	Breadwinner has Dutch nationality
Density	Ordered variable based on area of municipality per inhabitant (1 = high density (city), 5 = low density (sparsely populated country village))