Economic value of donating and volunteering behaviour associated with religiosity
SEIROS

2017

Contents

Executive summary

Religious organisations can play an important role in promoting the wellbeing of individuals and communities.

Deloitte Access Economics was engaged by The Study of the Economic Impact of Religion on Society (SEIROS)[1] to examine the economic impact of religiosity (specifically, attendance at religious services of any organised religious denomination) on giving and volunteering behaviour in Australia, using data from a national survey of over 7,000 Australians.

Controlling for a range of observable factors which might affect people's propensity to donate and to volunteer, we find that religious people are more likely to be donors and volunteers than non-religious people.

However, a range of factors which aren't measured in the survey (like how an individual was raised) could impact on both religiosity and volunteering/donating.

We estimate that religiosity is associated with **194,320 additional volunteers** in Australia each year who collectively **contribute 30.5 million hours** in volunteering time, or 2.4% of total volunteering hours in Australia, which is calculated from survey responses. The monetary value of this volunteering time is estimated at **$339 million**.

We also estimate that religiosity positively affects the likelihood of an individual to donate. Our findings suggest that religiosity brings about an additional **$142 million in donations** each year, or 1.7% of total donations in Australia, which is calculated from survey responses.

In total, the annual value to society of volunteering and giving associated with religiosity is estimated to be **$481 million**.

It's difficult to untangle religiosity from other factors which might cause donating and volunteering behaviour. We try to remove the influence of these other factors by only considering the activity of a subset of religious people – specifically, those who were not religious in their youth but are now – to religiosity.

In practice, this means that our estimates are conservative, because this only represents a small proportion of the broader religious community, and its volunteering and donating activity. Regardless, it is clear that volunteering and donating behaviour associated with religiosity provides a broader benefit to Australian society.

Deloitte Access Economics

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[1] SEIROS is an organisation comprised of leaders, representatives and researchers from different religious traditions, academics and policy makers.

1 Background

Religious organisations can play an important role in promoting the wellbeing of individuals and communities.

Research in the United States and in some other parts of the world has found that people who attend religious services are more likely to volunteer and donate funds to causes both within and beyond their congregations, even when general social and demographic factors are controlled (Cnaan 2013; Putnam & Campbell 2010).

Analysis of the relationship between religiosity and volunteering within and beyond religious congregations has also been explored extensively in the Australian context, although this research is based on data that is considerably out-of-date (Hughes & Black 2002; Leonard, Bellamy & Ollerton 2009; Leonard & Bellamy 2006, 2015; Lyons & Nivison-Smith 2006). These studies find variously that there is a positive relationship between volunteering in a religious congregation and volunteering for the wider community and mixed results on the relationship between religious orientation or activity and individual volunteering levels in the wider community.

1.1 Scoping study

In 2013, the Church of Jesus Christ of Latter-day Saints commissioned Deloitte Access Economics to conduct a scoping study (*The economic impact of religious activities – scoping study,* hereon 'the Study') to explore the feasibility of quantifying the impact of religious activities on broader society through reduced government spending on welfare services.

It identified literature from the United States suggesting that religiosity in that context was associated with a range of social outcomes – including better health, reduced crime, and increased volunteering and donating activity.

The link between religious activity and some people's attitudes and behaviours is generally well established in international sociological literature. Research linking religiosity and volunteering behaviour has also been explored in an Australian context, but is significantly dated. To date, there has been no quantification of the economic value of any volunteering and donating behaviour associated with religiosity.

In this context, the Study recommended that more data be collected to quantify the relationship between religiosity and volunteering and donating behaviours and estimate the economic value of these behaviours.

Specifically, the Study suggested a national survey to provide data on the differences in the levels of volunteering and donating in society between those involved in religious activity and those not involved.

1.2 This report

SEIROS is an organisation comprised of leaders and representatives from different religious traditions, academics and policy makers. SEIROS asked Deloitte Access Economics to:

- provide feedback on the design of a national survey;

- analyse data from this survey, to determine the statistical relationship between religiosity and donating and volunteering behaviour, controlling for a range of other factors; and
- quantify the economic value of any volunteering and donating or giving behaviour which is associated with religiosity.

Statistical analysis starts by assuming that there is no relationship between variables, and then seeks to ascertain whether this hypothesis can be disproved. We can only disprove this hypothesis if a statistically significant relationship is found after all other factors have been accounted for (Wooldridge 2012).

Similarly, this report uses econometric analysis to test two hypotheses:

1. Religious people are no more likely to volunteer for or donate to the broader community than non-religious people, all other things being equal; and
2. Religious volunteers and religious donors do not contribute more time or donations to the broader community than non-religious volunteers and donors, all other things being equal.

In order to statistically test these hypotheses, we employ an econometric framework to distinguish the causal influence of religiosity on volunteering and donating behaviours. Beyond determining whether a statistically significant relationship exist between religiosity and volunteering and donating behaviours, this framework seeks to arrive at a causal interpretation by exploiting differences between individuals that have experienced changes in religious status and a counterfactual cohort, that is, individuals that have not experienced changes in religious status.

The report proceeds as follows:

- Chapter 2 outlines the research methodology including survey design, fielding and details of the respondent sample, and the definitions used for the purpose of the report.
- Chapters 3 and 4 present findings on the relationships between religiosity and volunteering and giving, respectively.
- Chapter 5 summarises the key findings of the research.

2 Research methodology

In order to inform an analysis of the statistical relationship between religiosity and giving and volunteering behaviours in Australia, the Study suggested a national survey be conducted.

The core aims of the survey were to:

- collect consistent and representative Australian data on religiosity, giving and volunteering behaviour; and
- collect a sufficient amount of data to allow for an analysis to determine the relationship between these variables.

This chapter presents details on how the survey was designed and fielded, as well as key characteristics of survey respondents. It also sets out the key definitions and assumptions used for the report.

2.1 Survey design

A survey was designed by SEIROS and the Christian Research Association.

The survey was reviewed by Deloitte Access Economics.

The final survey included 48 questions covering 8 topics across family life, informal contributions to society, unpaid work, giving, influences growing up, employment, income, health and personal and household characteristics. A full version of the survey is in Appendix G.

2.2 Survey fielding

The survey was fielded by The Prospect Shop over February and March of 2017. Deloitte Access Economics understands that the survey was provided on the internet in HDML format, and sent to 8,154 people, of whom 95% (7,754 people) responded at least partially.

The sample sizes in each group of interest was determined to be sufficiently large and sufficiently representative of the Australian population to proceed with the analysis. To account for further differences between respondents in the sample and the population, we used a weighting methodology to match the sample to the population in order to scale up results to the total population. This methodology is provided in Appendix A.

2.3 Sample cleaning

The responses received from the survey are unbalanced (not every survey participant answered every survey question).

As such, in order to keep as many observations as possible, separate analyses were conducted for each of volunteering and giving. Specifically, each analysis only used respondents where there was enough data available on key variables of interest (including religiosity, age, income and giving and volunteering behaviours). As such, although there is significant overlap, different sample groups were used for the volunteering and giving analyses.

For each of these groups, two levels of sample cleaning were then conducted. Further detail is provided in Appendix A.

3. **Missing values**. Survey respondents who did not answer key questions were removed from the sample, and thus the analysis. Excluding responses in this way may introduce some bias in the analysis (if those who do not respond to a given question have common characteristics). However, this was deemed as the most conservative way of treating missing observations. While excluded responses inevitably share common characteristics along some variables, the composition of the sample in terms of religiosity was unaffected by the removal of missing values. Since the occurrence of missing values are not correlated with religiosity, the removal of these observations does not bias the econometric analysis.

4. **Outliers**. In some instances, respondents provided very high estimates of their time volunteered or their monetary giving. It is difficult to assess whether these responses are accurate, and including them in the analysis can introduce an upwards bias into the results. As such, the analysis for volunteering removes the top 1% of responses by reported hours volunteered. Similarly, the analysis for giving removes the top 1% of responses by reported amount donated. Removing extreme outliers results in lower estimates of hours and donations associated with religiosity in our analysis, but similarly to the above, this did not affect the composition of the sample in terms of religiosity.

Both steps were necessary to account for sample selection bias and to provide conservative estimates for the analysis.

Following this sample cleaning, there were **4,961 individuals in the volunteering sub-sample and 4,381 individuals in the giving sub-sample**.

The characteristics of these respondents are set out, respectively, in Sections 3.2 and 4.2 for the volunteering and giving sub-samples.

2.4 Key definitions
2.4.1 Religiosity
As detailed in Section 1.2, this report reflects SEIROS' interest in the economic impact of religiosity on volunteering and charitable giving, and asked Deloitte Access Economics to quantify the relationship between religiosity and volunteering and giving behaviour.

In order to quantify this relationship, it is first necessary to define religiosity. Oxford Dictionaries defines religiosity as a "strong religious feeling or belief". It is common to see religiosity as a multi-dimensional variable involving belief, public and private practice, salience and consequential dimensions (Stark and Glock, 1968). However, it is difficult in practice to classify people as religious or not under this definition.

We adopt a definition with a view to practicality and objectivity of measurement. Further, this study considers religiosity to be only those feelings, beliefs and behaviours associated with organised religious groups. In practice, this involves considering which of the variables collected might be used as a measure of an individual's religiosity.

There are two options in the data.

1. **Attendance**: That is, whether an individual in the survey reported having attended the services of any religious domination.

Frequency: That is, the frequency with which an individual reported attending religious institutions and/or services.

For example, the Australian Census of Population and Housing asks about religious affiliation and active participation in a religious or spiritual group as a means of classifying religiosity (ABS 2013). On the other hand, the Survey of Giving and Volunteering conducted by Giving Australia asks about religious identity and participation in religious services or ceremonies (religious participation) (Lyons & Nivison-Smith 2006).

The Survey did not ask questions directly relating to religious affiliation or identity, so for completeness, we completed initial analysis with both attendance and frequency variables but adopt only attendance. The justification for adopting attendance is detailed in Appendix B. Broadly, the direction of results was consistent regardless of the variable specification used.

We then measure the impact of religiosity by looking at treatment effects inside the sample. That is, the impact of religiosity is measured as the statistical relationship between our variables of interest and transitioning from being non-religious in childhood to being religious in adulthood, holding all other factors constant. We explain this approach in more detail in Section 2.5.

2.4.2 Giving and volunteering

People can give and/or volunteer to a variety of organisations and for different purposes. For example:

- donating to the school of a family member (for example contributions to a building fund or similar), to the direct benefit of the family member;
- donating to a religious institution of which an individual is a member, for example to support building maintenance or events;
- volunteering through a religious organisation to support a broader cause, such as feeding the homeless; or
- volunteering to provide support and care for a relative who is unwell.

Clearly, in some cases volunteering and giving behaviour supports a broader benefit to society, whereas in others it has a more direct impact on the individual doing the donating/volunteering. Formal volunteering is defined by the ABS to include people who willingly give unpaid help, in the form of time, service or skills, through an organisation or group (ABS, n.d.).

Erring on the side of caution, we define giving and volunteering behaviour through this report as formal behaviour which does not have a religious purpose, and serves a broader social good. Table 2.1 maps which behaviours are included for the purposes of this analysis.

Table 2.1: Types of giving and volunteering behaviours included in this report

Purpose \ Organisation	Religious (e.g. church group, Salvation Army)	Non-religious
For the benefit of a religious organisation	✘	n/a
For the benefit of others	✔	✔
For the benefit of family, relatives or friends	n/a	✘

2.4.2.2 Volunteering

We consider two volunteering variables:

- whether an individual is a volunteer; and
- how many hours they volunteer.

An individual is defined as a volunteer if they:

- ticked at least one of the boxes (excluding the religious organisations box) in question 16 which asks "In the past 12 months, did you do unpaid voluntary work for any of these types of organisation?"; and
- did not put down "0" in question 17, which asks "how many hours have you spent doing unpaid work for people excluding your immediate family".

That is, we have excluded volunteers who have:

- only done unpaid work for religious organisations (including churches) for the benefit of religious organisations; or
- only done unpaid work for members of their immediate family (e.g. caring responsibilities).

An individual's volunteering hours for non-religious purpose were calculated as their volunteering hours (question 17) excluding the proportion of work they did for religious organisations (asked in question 20).

By only considering a subset of formal volunteers, this analysis is a cautious estimate of the economic value of volunteering behaviour associated with religiosity.

2.4.2.3 Giving

We consider two giving variables:

- whether an individual is a donor; and
- how much value they have donated.

An individual's donation value for non-religious purpose was calculated as the product of their answer to question 46 (number of times donated) and question 47 (typical value per donation) in the following categories:

- Cash donations to charitable causes (excluding contributions to political parties and to religious organisations for the benefit of the religious organisations); and

- Gifts in kind to charitable causes, such as food or clothing (excluding contributions to political parties and to religious organisations for the benefit of the religious organisations).

We do not include giving to friends or family (such as gifts).

An individual is defined as a donor if their donation value for non-religious purpose is non-zero.

2.5   Notes on causality

How an individual is raised, or other, innate characteristics they might have, might be a significant determinant of an individual's behaviour. For example, having volunteered as a child, or having parents who are donors, could contribute to demonstrating these behaviours in adulthood. Similarly, an individual who is more innately altruistic might be more likely to volunteer and give.

If religiosity is correlated with any of these behaviours, then our quantitative analysis may pick up some of these factors, and this would impact how precisely we can measure the true effect of religion, net of all other factors.

To control for this, we use two techniques.

1) Control for other factors

Using the survey data, we control for a range of other factors in our analysis which could explain giving and volunteering behaviour. Our controls include variables like income, age, gender, childhood giving/volunteering, and family giving/volunteering. A full list of control variables used in the volunteering and donating analyses is included in Chapters 3 and 4 respectively.

Changes in these variables can plausibly affect volunteering and giving in different directions. Take for instance employment status. Individuals working full-time are likely to be earn higher income, but have less leisure time than those working part-time or are retired. Relatedly, individuals earning higher income will usually have more disposable income and be more likely to donate. However, the opportunity cost of their volunteering time is also higher, hence so we might expect high-earning individuals to volunteer less. The propensity to volunteer and donate can also change as people age. Young people, particularly students, and older people who are retired will likely have more time to volunteer, though less disposable income to donate, than those in the working age population.

Influences while growing up are also expected to have an effect on individuals' intentions and thus behaviour. Those who grew up volunteering, or had parents who volunteered, are likely to have a disposition towards volunteering that endures through to adulthood.

2) 'Treatment effect'[2] – isolating the effect of religiosity

As previously noted, accounting for measurable differences in characteristics still may not control for some unmeasurable, individual characteristics.

As such, we instead attempt to measure a 'treatment effect' (MIT Economics, 2017). In a hypothetical scenario where an individual was not religious and becomes religious, but all of their other characteristics remain the same, how would their volunteering and giving behaviour change?

Ideally, this would be done using a randomised control trial; however in practice this is not realistic. This is because an ideal experiment would involve randomly assigning individuals from childhood into a 'control' and 'treatment' group. In the control group, individuals would remain non-religious from childhood to adulthood, and in the treatment group, individuals would be made to begin attending religious services at a distinct point in time. Such a tightly controlled experimental environment would also ensure that individuals do not undergo any changes concurrently with the change in religiosity. Observed changes to volunteering and donating behaviour could then be attributed to the treatment effect of religiosity. Clearly, such experiments are not possible in real life.

For the purpose of this analysis we measure the impact of religiosity by looking at transitions; individuals who changed their religiosity during their lives. This imputes a 'treatment effect'[3], assuming that the innate characteristics of the individual have stayed the same during their life. We consider the treatment effect in a single direction only – from non-religious to becoming religious. As the hypotheses to be tested are restricted to the effect of 'treating' an individual with religiosity, we do not consider the effect of non-religiosity, that is, transitions in the opposite direction from religious to non-religious.

For ease of interpretation, we specifically examine to what extent an individual's propensity to volunteer or give (or the amount they volunteer/give) changes if they were not religious as a child, but subsequently became religious, holding all else constant. To be clear, we do not compare individuals' volunteering and donating behaviour in childhood to the same individuals' behaviour in adulthood. Rather, we are comparing the volunteering and donating behaviour of individuals who remained non-religious throughout childhood and adulthood, and individuals who were non-religious in childhood and became religious in adulthood.

Even with the controls outlined above, it is still difficult to determine whether religiosity is **causing** volunteering/donating behaviour, or whether it's merely **correlated** to the real underlying cause.

Relatedly, it is also possible that reverse causality exists – individuals who are strongly motivated to volunteer for the community may gravitate towards religious activities. As such, it is important to note that this analysis does not conclude that religiosity *causes* volunteering/donating.

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[2] This is a technical term used in economics. Wooldridge (2009) describes "*The experimental group or treatment group does take part in the program. These names come from literature in the experimental sciences, and they should not be taken literally*."

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Econometrics

Econometric analysis is a tool that economists use to try to identify causation between an outcome variable and one or more explanatory variables of interest that are hypothesised to affect the outcome variable.

Economists and other social scientists are rarely able to create and use experimental data to understand the effects of variables on social and economic behaviours. This is because it is "often impossible, prohibitively expensive, or morally repugnant to conduct the kinds of controlled experiments that would be needed to address economic issues" (Wooldridge 2012). Therefore, econometric modelling is often applied to observational data on individuals, where those who exhibit observable differences in the explanatory variable of interest are assigned to 'treatment' or 'control' groups. The 'control group' serves as a counterfactual, as all other factors that could affect the outcome variable are held constant. As Wooldridge (2009) explains:

"In the simplest case, there are two groups of subjects. The control group does not participate in the program. The experimental group or treatment group does take part in the program. These names come from literature in the experimental sciences, and they should not be taken literally. Except in rare cases, the choice of the control and treatment groups is not random. However, in some cases, multiple regression analysis can be used to control for enough other factors in order to estimate the causal effect of the program…

[However] As with any other independent variable, we should ask whether the measured effect of a qualitative variable is causal… we can only hope we have controlled for as many factors as possible that might be related…

… individuals self-select into certain behaviors… when a binary indicator of participation might be systematically related to unobserved factors… multiple regression analysis can, to some degree, alleviate the self-selection problem… unfortunately, in many cases, we are worried that unobserved factors are related to participation, in which case multiple regression produces biased estimators… we must be aware of finding spurious effects of programs on outcome variables due to the self-selection problem."

The characteristics of 'treatment' groups are hence not generally representative of a population group, as researchers select individuals who display characteristics that best exemplify the 'treatment effect' of causality.

Contrasting outcomes between the 'treatment' and 'control' groups allows researchers to isolate the effect of the explanatory variable of interest on the outcome variable, which is also known as the 'treatment effect'. "The concept of causality is based on the notion of controlled variation – variation in treatment holding other factors constant" (Heckman 2008).

An important caveat on determining causality is that it is unlikely a model can fully capture all of the factors that drive differences in the outcome variable across individuals. The presence of underlying variables that are unobserved by researchers means that a causal relationship between the variable(s) of interest and the outcome variable cannot claimed definitively.

3 Religiosity and volunteering

SEIROS asked Deloitte Access Economics to analyse the survey results in order to determine whether there is a statistically significant relationship between religiosity and volunteering, and if so, to quantify the monetary value of any additional volunteering contributed by religious individuals that would not have occurred were the individuals not religious.

3.1 Identifying the effect of religiosity

In accordance with standard statistical processes, we tested a hypothesis that religiosity is not correlated with volunteering behaviour. Evidence of a statistically significant relationship between religiosity and volunteering would disprove this hypothesis and suggest that religiosity is correlated with volunteering.

However, this correlation alone would not prove that religiosity has an effect on volunteering. Any relationship found between religiosity and volunteering could capture influences that relate to an individual's propensity to attend religious services as well as to volunteer.

As such, we need to isolate the effect of religiosity on volunteering by controlling for factors which might be correlated with both religiosity and volunteering.

We control for the following factors that are observed in the survey responses:

- age range;
- gender;
- education level;
- employment status;
- income;
- health status;
- having volunteered while growing up;
- having volunteered for a religious organisation while growing up; and
- growing up with parents who volunteered.

However, other individual characteristics are more difficult to measure but can still be confounded with religiosity to explain volunteering or donating behaviour.

For example, altruistic values, family or ethnic background and upbringing, friendship influences, social norms and the closeness of community ties are all factors which could affect the extent to which an individual is both religious and does voluntary work. Without controlling for these characteristics, total effects on volunteering would wrongly be attributed to religiosity alone.

In order to isolate the effect of religiosity regardless, we can look at individuals' transitions in religious status over time, and how these relate to the likelihood and propensity to volunteer. Specifically, we are interested in whether individuals transitioning from not attending religious services to

attending is correlated with differences in volunteering behaviour. Assuming that the unmeasurable, individual characteristics are constant, this correlation approximates the 'treatment effect' of being religious, or the effect of being 'treated' by religiosity.

There are two parts to the hypothesis that we test to capture different degrees of volunteering behaviour:

- the likelihood of being a volunteer, and;
- the number of hours volunteered.

There are two potential impacts on volunteering outcomes that we consider – whether an individual volunteers at all, and if so, how many hours the individual volunteers. Figure 3.1 illustrates the two potential impacts: if average hours volunteered per person is unchanged but the number of volunteers increases, this will result in a higher total number of hours volunteered. Likewise, if the number of volunteers is unchanged but each volunteer contributes more hours on average, then this will also result in a higher total number of volunteering hours.

Figure 3.1: Factors driving total hours volunteered
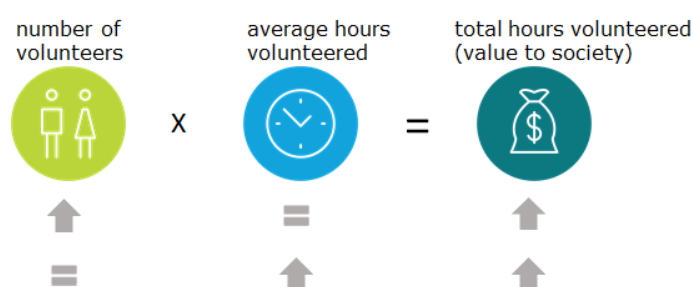
Source: Deloitte Access Economics

As the study seeks to understand the impact of religiosity on broader society, only non-religious volunteering (i.e. volunteering which benefits the broader community) is considered, as described in Section 2.4.2.

3.2   Survey respondent characteristics

The volunteering sub-sample includes 4,961 individuals. There is an even split among the three age groups of 18-34 years, 35-54 years and 55 years and older, but there is a higher proportion of females than males. In terms of educational attainment, the most frequently achieved level of education was secondary schooling, followed by Bachelor degree, Diploma, Trade Certificate, and equal proportions of those with a Postgraduate degree and those who completed a primary education. The sub-sample is also weighted towards those with low income: over half (52%) of the sub-sample have a weekly earned income below $1300, with 26% earning between $1300 to $2800, and 7% earning over $2800. The majority (67%) of respondents in the volunteering sub-sample have no health difficulties.

Table 3.1 to Table 3.5 illustrate descriptive statistics across these variables.

This sub-sample is fairly representative of the Australian population in terms of general demographics such as gender, state of residence and household income. A weighting procedure was applied to align the age distribution in the sample to the ABS distribution and is discussed in Appendix A:.

Table 3.1: Age distribution, volunteering sub-sample

18 to 34	35 to 54	55 years and over
33%	33%	34%

Source: Deloitte Access Economics

Table 3.2: Gender distribution, volunteering sub-sample

Male	Female
41%	59%

Source: Deloitte Access Economics

Table 3.3: Educational attainment, volunteering sub-sample

Primary	Secondary	Trade certificate	Diploma	Bachelor degree	Postgraduate degree
10%	27%	15%	17%	21%	10%

Source: Deloitte Access Economics

Table 3.4: Weekly earnings distribution, volunteering sub-sample

Less than $800	$800 to $1300	$1300 to $1800	$1800 to $2800	Over $2800	Don't know
28%	24%	15%	11%	7%	15%

Source: Deloitte Access Economics

Table 3.5: Health status, volunteering sub-sample

No difficulties	With difficulties	Don't know
67%	30%	4%

Source: Deloitte Access Economics

3.3   Results

3.3.1   Likelihood of being a volunteer

As discussed in Section 2.5, other than religiosity, a number of factors could affect the likelihood that an individual will be a volunteer. As such, we control for a number of factors including age, gender, health, employment status, income, and growing up volunteering or growing up with parents who volunteer.

Our model finds that a range of factors have a statistically significant impact on an individual's likelihood of being a volunteer. Due to the structure of the model, the impact of each of these factors will depend on the individual in question. A sample of individual 'personas' are presented in Table 3.6 to illustrate this.

Logistic regression

We employ a logistic regression (logit) model to estimate the probability that an individual will be a volunteer; similarly, we use a logit model to estimate the probability that an individual will be a donor.

Logit models are used in cases where the dependent variable of interest is binary. As Wooldridge (2009) notes, linear probability models (i.e. using OLS techniques when the dependent variable is binary, has shortcomings in that "predictions [can be] less than zero or greater than one" and "probability cannot be linearly related to the independent variables for all their possible values". Logit models address these issues.

Coefficients estimated by the logit model are interpreted as logarithmic odds (converted to probabilities) and relative to a reference group with a fixed set of characteristics (Sperandei 2014). This means the marginal effects of each variable are highly dependent on individual characteristics and cannot be interpreted as fixed.

To provide meaningful interpretations, we calculate the effects of each independent variable in two different ways. The first approach is to calculate the marginal effects on the probability of volunteering or donating of an average person, by factoring in the average value of each variable in the sample (details in Appendices D.1 and E.1). The second approach is to choose several representative 'personas' with a fixed set of characteristics and compare their probabilities of volunteering or donating. Results from both approaches are presented in Chapters 3 and 4.

We also find that religious attendance, and changes to religious attendance over time, are a statistically significant predictor of an individual being a volunteer.

The average person who has attended religious services throughout childhood and adulthood has a 50% probability of being a volunteer. Compared to the average person who has never attended religious services, this person has an 11 percentage point higher likelihood of being a volunteer, however this cannot be interpreted as a treatment effect.

As discussed in Section 2.5, given difficulties with establishing causality, the body of results in this section measure the impact of religiosity by the difference in behaviour between two groups – individuals who did not attend religious services in their youth but do attend as an adult, and individuals who never attended religious services (in youth or adulthood).

We find that an average person who does not attend religious services and did not as a child have a 38% likelihood of being a volunteer. On the other hand, the average person who transitions from not attending as a child to attending as an adult has a 63% likelihood of being a volunteer. This implies that the treatment effect of being religious is 25 percentage points, and the probability ratio of volunteering for the average person who is religious relative to the average person who has never been religious is 1.7 (63% divided by 38%).

That is, **a person who becomes more religious is 1.7 times more likely, on average, to be a volunteer than someone who has never been religious, all else being equal.**

Table 3.6: Probabilities of volunteering for example 'personas'

Gender	Age	Education	Employment	Income	Volunteered while growing up	Had parents who volunteered	Religious attendance	Overall probability
Female	25	Primary school	Part-time	Below $800	No	No	Never	11%
Male	40	Trade certificate	Self-employed	$1300 to $1800	Yes	No	Not as a child, yes as an adult	43%
Female	45	Postgraduate degree	Full-time	$1800 to $2800	Yes	Yes	Never	32%
Male	55	Secondary school	Full-time	$800 to $1300	No	No	Always	17%

3.3.2   Number of hours volunteered

Though people who attend religious services are more likely to volunteer than people who do not, all other characteristics being equal, the question remains as to whether they volunteer more hours than people who are not religious.

There are a number of other factors that could affect an individual's volunteering intensity, such as employment status and income. As such, we test for the relationship between religious attendance and the number of hours volunteered while controlling for a number of factors. As the number of hours volunteered is a continuous variable, we use Ordinary Least Squares (OLS) regression, as detailed in Appendix D.2.

We find that the only significant predictor for volunteering intensity is an individual's employment status. Consider the example in Table 3.6 of a woman aged 25 who was never religious, only completed primary education, did not grow up volunteering or have parents who volunteered, works part-time and earns below $800. Someone who fits this profile volunteers an average of 5 hours and 10 minutes each month.

Table 3.7: Numbers of hours volunteered for an example 'persona' as employment status changes

Full-time	Home duties	Retired	Working without pay	Unemployed
1 hour less	1 hour more	40 minutes more	3 hours and 24 minutes more	1 hour and 40 minutes more

Controlling for all factors, we find that **there is no statistically significant relationship between religiosity and number of hours volunteered**.

3.4   Monetary value of volunteering

3.4.1   Additional hours volunteered

We conclude that people who transition from not attending religious services to attending religious services are more likely to be volunteers than those who never attended religious services. However, volunteers who transition to being religious do not volunteer more hours than volunteers who remain non-religious, holding other factors constant.

Despite the fact that there is no statistically significant difference in hours, the increased likelihood of being a volunteer in the first instance still means that religiosity is associated with a higher level of overall hours volunteered. This is due to the relationship pictured in Figure 3.1; an individual who becomes a volunteer necessarily volunteers more hours than an individual who is not a volunteer.

Because we are measuring the treatment effect by looking at individuals who became religious (but were not raised religious), we can interpret these hours as being additional. That is, noting the issues with causation discussed in Section 2.5, we can say that these additional hours are associated with religiosity.

As per Section 3.3.1, we find that **people who transition from being non-religious to being religious have a 25 percentage point higher likelihood of being volunteers**.

We estimate that 4.2% of the adult population, or approximately 726,600 Australians, may have transitioned (that is, gone from being non-religious to being religious). Applying the increased likelihood of volunteering to this group, we estimate that the religiosity treatment effect is associated with **194,320 additional volunteers**.

This is necessarily an underestimate, because it does not account for the volunteering behaviour of individuals who have always been religious, due to difficulties with interpreting this causally (as discussed in Section 2.5).

It is then necessary to determine how many hours the average volunteer volunteers. Of course, volunteers will volunteer more time on average than the overall population, because being a volunteer means that you are giving at least one hour. Using our survey results, we find that **the average volunteer volunteers 13 hours a month, or 157 hours annually**.

Aggregating up to the population, the impact of religiosity through more volunteers is associated with an additional **30.5 million hours of volunteering** to society each year. This is equivalent to about **2.4% of total volunteering hours** in the economy.

3.4.2   Value of additional hours

There are two avenues for valuing volunteering time.

1. **Opportunity cost**: This method measures the value that individuals forego by volunteering; that is, the value of what they may otherwise be doing with their time if they were not volunteering.
2. **Replacement cost**: This method measures the cost of replacing a volunteer. That is, if there were no volunteers and the same tasks had to be completed by a paid worker, what would be the wage cost of their time.

Both methods are valid. However, an opportunity cost methodology is likely to be more conservative, since it would imply that if individuals were not

volunteering, they would have more leisure time. A replacement cost methodology would assume that if there were no volunteers, the exact same tasks would need to be conducted by a paid workforce. In practice, it is unlikely that all organisations with formal volunteering positions will pay for replacement if they are unable to recruit volunteers for the position.

As such, though this report calculates both opportunity cost and replacement cost measures, for conservatism, we use the opportunity cost method.

3.4.2.1 Opportunity cost

To calculate opportunity cost, according to the Australian Bureau of Statistics (ABS), the average Australian weekly earnings for an adult working full time in Australia in November 2016 were $1592.40. Earnings after tax and superannuation are $1,205.58. Assuming that volunteers also have to travel to work, to estimate a net wage, $100 worth of expenses is deducted as costs of getting to work. This implies that the average full-time worker earns an average of $1,105.58 per week net of taxes and expenses.

Assuming a 38 hour working week, and that the average person takes an additional 6.75 hours commuting to and from work each week, average hourly earnings would be $24.71 (Milthorpe 2007). The approach taken in this study assumes that the opportunity cost of volunteers is leisure activity, that is, their employment status already reflects their preferences for work and they are not forgoing wages in order to volunteer. Previous studies have found that one hour of leisure is worth 45% of the value of an hour of employment to the individual (Larson and Shaikh 2004). On this basis, the hourly leisure rate is assumed to be $11.12 for Australians on average (Deloitte Access Economics, 2016).

3.4.2.2 Replacement cost

To calculate replacement cost, we consider the skill level of the volunteering positions. We use survey responses to question 18, which asks whether the unpaid work completed by individuals who volunteer required:

- professional expertise;
- trade skills;
- other skills; or
- no special skills.

We match each skill level to ABS wage data by occupation and calculate a weighted weekly wage rate of $1346.98. This yields an hourly wage rate of $30.10.

3.4.2.3   Value of hours

Analysis using both opportunity cost and replacement cost is presented in Table 3.8.

Table 3.8: Opportunity and replacement costs

Opportunity cost		Replacement cost	
Hourly wage rate	Total monetary value of volunteering	Hourly wage rate	Total monetary value of volunteering
$11.12	$339 million	$30.10	$918 million

For conservatism, we use the opportunity cost approach, by deriving the monetary value of additional volunteering hours using the value of leisure time (Deloitte Access Economics, 2016).

The monetary value of volunteering is therefore calculated as the product of additional overall hours volunteered, 30.5 million hours by the hourly rate of $11.12.

The total monetary value of volunteering associated with religiosity is estimated to be around $339 million annually.

4 Religiosity and giving

SEIROS asked Deloitte Access Economics to analyse the survey results in order to determine whether there is a relationship between religiosity and giving, and if so, what the monetary value of any additional donations is.

4.1   Identifying the effect of religiosity

In accordance with standard statistical processes, we tested a hypothesis that religiosity is not correlated with, or causal of, giving or donating behaviour, defined as cash donations and gifts in kind. There are two parts to this hypothesis capturing different degrees of giving – the likelihood of donating and the amount donated.

Evidence of a statistically significant relationship between religiosity and volunteering would disprove this hypothesis and suggest that religiosity is correlated with giving.

As per Chapter 3, we control for factors other than religious status to isolate the effect of religiosity on the likelihood and intensity of donating.

We control for the following factors that are observed in the survey responses:

- age range;
- gender;
- education level;
- employment status;
- income; and
- health status.

Again, we are interested in proxying the 'treatment effect' of religion by testing whether individuals transitioning from not attending religious services to attending religious services is correlated with differences in volunteering behaviour. We consider only donations for non-religious purposes.

There are two potential impacts on giving outcomes that we consider – whether an individual donates at all, and if so, how much the individual donates.

4.2   Survey respondent characteristics

The giving sub-sample includes 4,381 individuals. They are evenly split among the three age groups of 18-34 years, 35-54 years and 55 years and older, but there is a higher proportion of females than males. In terms of educational attainment, the most frequently achieved level of education was secondary schooling, followed by Bachelor degree, Diploma, Trade Certificate, and roughly equal proportions of those with a Postgraduate degree and those who completed a primary education. The sub-sample is also weighted towards those with low income: over half (53%) of the sub-sample have a weekly earned income below $1300, with 25% earning between $1300 to $2800, and 7% earning over $2800. The majority (66%) of respondents in the giving sub-sample have no health difficulties.

Table 4.1 to Table 4.5 illustrate descriptive statistics across these variables.

This sub-sample is fairly representative of the Australian population in terms of general demographics such as gender, state of residence and household income. A weighting procedure was applied to align the age distribution in the sample to the ABS distribution and is discussed in Appendix A:

Table 4.1: Age distribution, giving sub-sample

18 to 34	35 to 54	55 years and over
34%	33%	33%

Source: Deloitte Access Economics

Table 4.2: Gender distribution, giving sub-sample

Male	Female
42%	58%

Source: Deloitte Access Economics

Table 4.3: Educational attainment, giving sub-sample

Primary	Secondary	Trade certificate	Diploma	Bachelor degree	Postgraduate degree
9%	27%	15%	17%	21%	10%

Source: Deloitte Access Economics

Table 4.4: Weekly earnings distribution, giving sub-sample

Less than $800	$800 to $1300	$1300 to $1800	$1800 to $2800	Over $2800	Don't know
29%	24%	14%	11%	7%	15%

Source: Deloitte Access Economics

Table 4.5: Health status, giving sub-sample

No difficulties	With difficulties	Don't know
66%	30%	4%

Source: Deloitte Access Economics

4.3 Results

4.3.1 Likelihood of giving

We measured the impact of a range of variables on the likelihood of donating. We controlled for a number of factors including age, sex, health, employment status, and total household weekly income. As noted in Section 2.5, each of these factors can independently influence individuals' likelihood to donate.

Our model finds that a range of factors have a statistically significant impact on an individual's likelihood of being a donor. Due to the structure of the model as explained in Chapter 3, the impact of each of these factors will depend on the individual in question. A sample of individual 'personas' is presented in Table 4.6.

We also find that religious attendance, and changes to religious attendance over time, are a statistically significant predictor of an individual being a donor.

The average person who has attended religious services throughout childhood and adulthood has a 64% probability of being a volunteer. Compared to the average person who has never attended religious services, this person has a 20 percentage point higher likelihood of being a volunteer; however, this cannot be interpreted causally.

As discussed in Section 2.5, given difficulties with establishing causality, the body of results in this section measure the impact of religiosity by the difference in behaviour between two groups – individuals who did not attend religious services in their youth but do attend as an adult, and individuals who never attended religious services (in youth or adulthood).

Controlling for other factors, people who have never been religious have a 45% likelihood of donating. However, we find that people who transition from having never been religious to being religious (again measured as stated attendance at religious services) have a 68% likelihood of donating. This implies that the treatment effect of being religious is 23 percentage points, and the probability ratio of volunteering for the average person who is religious relative to the average person who has never been religious is 1.5 (68% divided by 45%).

That is, **individuals who transition to being religious are 1.5 times more likely to be donors than those who have never been religious, all else being equal**.

Table 4.6: Probabilities of giving for example 'personas'

Gender	Age	Education	Employment	Income	Religious attendance	Overall probability
Female	25	Primary school	Part-time	Below $800	Never	9%
Male	40	Trade certificate	Self-employed	$1300 to $1800	Not as a child, yes as an adult	26%
Female	45	Postgraduate degree	Full-time	$1800 to $2800	Never	38%
Male	55	Secondary school	Full-time	$800 to $1300	Always	33%

4.3.2   Donation amount

Though people who became religious in adulthood (but were not religious in their youth) are more likely to donate, all other characteristics being equal, the question remains as to whether they donate more than people who are not religious. As the amount of money donated is a continuous variable, we use Ordinary Least Squares (OLS) regression, as detailed in Appendix D.2.

There are a number of factors that could affect the value of an individual's donations, given that they have donated a positive amount over the last 12 months. We find that the only factors that have a statistically significant bearing on the amount donated is an individual's age, gender, education and income. An illustration of the effects of these variables is presented for different example 'personas' in Table 4.7.

When we control for these and other factors, we find that there is **no statistically significant relationship between religiosity and amount donated**.

Table 4.7: Donation amounts for different example 'personas'

Gender	Age	Education	Employment	Income	Donation amount
Female	25	Primary school	Part-time	Below $800	$50
Male	40	Trade certificate	Self-employed	$1300 to $1800	$102
Female	45	Postgraduate degree	Full-time	$1800 to $2800	$207
Male	55	Secondary school	Full-time	$800 to $1300	$75

4.4   Monetary value of donations

We conclude that people who transition from not attending religious services to attending religious services are more likely to donate than those who never attended religious services. However, there is no significant difference in amount donated between those who are religious and those who are non-religious.

This means that religiosity is associated with additional donations, because becoming religious is associated with a greater likelihood of being a donor relative to those who were never religious.

That is to say, if an individual remains non-religious, then their predicted likelihood of giving is lower compared to if they were non-religious and subsequently became religious. Thus, the transition to religiosity is associated with more giving, all else being equal.

The monetary value of additional giving is determined by the number of people who donate and the average amount each person donates.

In this case, religiosity is associated with an increase in the number of people who donate. From our findings, people who transition from being non-religious to being religious have a 23 percentage point higher likelihood of being donors.

Based on the survey data, we estimate that approximately 726,600 Australians (4.2% of the adult population) have transitioned from being non-religious to being religious.

It is then necessary to determine how much the average person donates, given s/he makes a positive donation at all. Using our survey results, we find that the average person who donates will give $781 per year.

Total additional donations can then be calculated as the product of the average amount donated annually, the number of Australians who transition from being non-religious to religious, and the 23 percentage point uplift in probability of making a donation associated with this cohort. Aggregating up to the population, we estimate that people who transition from being non-religious to religious are associated with an additional **$142 million of donations annually**. Relatively speaking, this annual contribution amounts to 1.7% of total donations made in the economy.

Conclusions

In accordance with international sociological research, there appears to be a relationship between religiosity and the likelihood of volunteering and giving.

Our analysis finds that religious people are more likely to be donors and volunteers than non-religious people, holding a range of other factors constant.

Specifically, we find that the average individual who is religious throughout both childhood and adulthood has an 11 percentage point higher likelihood of being a volunteer and a 20 percentage point higher likelihood of being a donor than the average individual who is unreligious throughout childhood and adulthood.

However, there are other personal characteristics which may contribute to both an individual's likelihood to be religious and their volunteering and donating behaviour. This means that correlations between religiosity and volunteering/donating behaviour cannot be interpreted causally.

As such, the analysis in this report focuses on individuals who have gone from being non-religious to being religious. This is necessarily not representative of the broader religious population – however, it allows stronger conclusions to be made.

Core findings

Even controlling for a range of other factors – including income, age, gender and childhood experiences of volunteering and giving – we find that individuals who become religious are more likely to be donors and volunteers than those who remain unreligious through childhood and adulthood.

The analysis did not find that religiosity was a significant determinant of the amount donated or the time volunteered, for individuals who are already donors or volunteers respectively.

We find that the average individual who becomes religious as an adult but is not religious in childhood has:

- a 25 percentage point higher likelihood of being a volunteer than the average individual who remains unreligious throughout childhood and adulthood; and
- a 23 percentage point higher likelihood of being a donor compared to the average individual who remains unreligious throughout childhood and adulthood.

Value of activity

In total, we estimate that additional volunteering associated with religiosity (measured as additional volunteering undertaken by individual who become religious as adults but were not religious in childhood, as opposed to those who have never been religious) is around **30.5 million hours**. We estimate conservatively (using an opportunity cost methodology) that the value of this time is approximately **$339 million annually**.

We also find that people who become religious are more likely to donate to non-religious organisations. Specifically, we estimate that becoming religious is associated with around 180,000 more people in the population being donors. Using an average annual donation value of approximately $780, we estimate the annual value of donations by these people is around **$142 million**.

In total, this implies that additional volunteering and giving behaviour associated with religiosity has an estimated annual value of **$481 million**.

Limitations

This is necessarily an underestimate of the total value of volunteering and donating behaviour, given the econometric approach taken to identify the causal effects of religiosity (which does not attribute the donating and volunteering activity of individuals who have always been religious to religiosity).

It is further important to note that the nature of causality is not clear. Though the analytical approach taken in this paper seeks to control for as many factors as possible, we still cannot definitively conclude that this value is entirely attributable to religiosity. However, it is clear that the volunteering and donating behaviour associated with religiosity confers a broader economic benefit to society.

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Appendix A: Data pre-processing

Data pre-processing is required to extract, trim and weight the survey data to suit the need of the econometric analysis. It includes 3 stages, as set out below.

- **Original sample:** contains 7756 observations from all respondents;
- **Removing missing values**: 2609 and 3330 observations from the volunteering and giving sub-sample, respectively, needs to be removed from the analysis sample due to missing values in variables of interest (e.g. Hours volunteered, amount donated, age, gender, income, etc.);
- **Trimming**: observations within the top 1% percentile of the volunteering/giving variables are also removed due to high leverage and credibility concerns. This results in 4948 and 4381 of observations, respectively, for the two analysis;
- **Weighting**: the samples for both volunteering and giving were separately weighted to match the population distribution of age, gender and state of residence from the ABS data. This does not change the number of observations.

Table A.1 shows the number of observations in the sample after each step.

Table A.1 Number of observations resulted from each step of data pre-processing

	Volunteering sub-sample	**Giving sub-sample**
Original sample	7756	7756
Removing missing values	5066	4426
Trimming	4948	4381
Weighting	4948	4381

This section presents each step of the data pre-processing in detail.

A.1 Removing missing values

The original sample includes a substantial number of observations that contains missing values. Table A.2 below shows the number and proportion of missing values for each variable in the sample.

Table A.2 Count of missing observations

Variable	# of missing observations	% of responses which are missing
Religious status	1604	21%
Age group	38	0.49%
Gender	137	2%
Income group	1106	14%
Health status	1100	14%
Employment status	79	1%
Education level	1038	13%
Volunteering organisations	574	7%
Volunteering hours	785	10%
Parents volunteering (dummy)	971	13%
Volunteered at school (dummy)	1043	13%
Volunteered in religious organisation (dummy)	1081	14%
Total donation	2461	32%
Total donation (excluding political and religious purposes)	2317	30%

Any analysis is strengthened by having more available observations. As such, to keep as many observations as possible for the analysis, we remove missing values separately in each of the sub-samples (i.e. volunteering and giving).

After removing missing observations, the total number of observations in the sub-sample used for the volunteering analysis is higher than that for the giving analysis. This is because there were more missing observations in the two variables associated with donation (see Table A.2).

Some observations have missing values in multiple variables. As a result, the total number of removed observations is significantly less than the sum of the second column in Table A.1. Overall, the removal process has resulted in 5066 and 4426 observations in the volunteering and giving sub-samples respectively.

Given the purpose of the analysis is to compare the volunteering/giving activities across subgroups of the sample based on their religious status, care needs to be taken to ensure that the composition of the sample in terms of religious status is not affected by the removal of the missing values. That is because if we exclude observations which are systematically related to religiosity and volunteering/donating behaviour, the econometric analysis would suffer from a sample selection bias. We delay the investigation of this to the next section because the trimming of the data might also affect the distribution of the religious status in the sample.

A.2 Trimming the sample data

Our analysis shows that the sample contains some outliers – extreme observations with exceptionally high volunteering hours and/or giving amounts. For example, 8 people reported volunteering hours of more than 300 hours per month, which is greater than 10 hours a day in a 30-day period, and 7 people reported giving more than $1 million over the last 12 months.

These extreme values might result from recording errors, misinterpretation of the questions, or donkey responses. Including extreme values with potentially high measurement errors could bias the estimates from the econometric analysis. Our approach to this is to trim the top 1 percentile of responses, both for the volunteering and giving sub-samples, and remove them from our analysis. Consistent with the removal of missing values, the trimming of the data is also done separately for the two sub-samples.

A.2.1. Volunteering

Removing the top 1% of responses leads us to remove a total of 118 observations from the volunteering sub-sample. Specifically, we trim the 65 submissions that ticked more than 6 types of organisations (top 1%) in Question 16[4] and the 56 submissions that reported volunteering more than 100 hours per month (top 1%) in Q17[5].

This is visualised as a scatter plot in Chart A.1, with the reported number of volunteering hours (Q17) on the horizontal axis and the number of types of organisations volunteered for (Q16) on the vertical axis. The dark blue points represent the kept observations while the grey cross symbols represent the removed ones.

Chart A.1 Trimming of the volunteering sub-sample
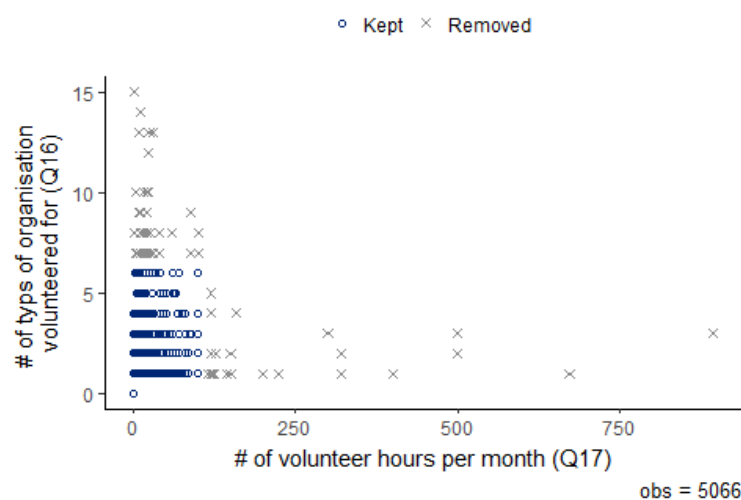
It should be noted that not all of the removed observations from the trimming process are incorrect or non-credible. It is not unreasonable for someone to supply more than 100 hours volunteering hours per month and/or volunteer for more than 6 types of organisations in the last 12 months. However, the trimming approach is adopted to provide a conservative estimates for the purpose of this analysis.

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[4] Q16 asked the respondents to tick the types of organisations that they have done voluntary work for in the last 12 months, see details in Appendix G:.

[5] Q17 asked explicitly about the average volunteering hours per month (for members other than the immediate family), see details in Appendix G:.

A.2.2. Giving

A similar approach has been adopted for the giving analysis. A total of 45 observations represent the top 1% of annual donations by value (donating more than $36,212.50 annually). These are removed from the giving sub-sample. These observations sit above the grey dashed horizontal line in Chart A.2 below, which shows the empirical cumulative distribution of the total donation amounts across the giving sub-sample.

Chart A.2 Trimming of the giving sub-sample

obs = 4426
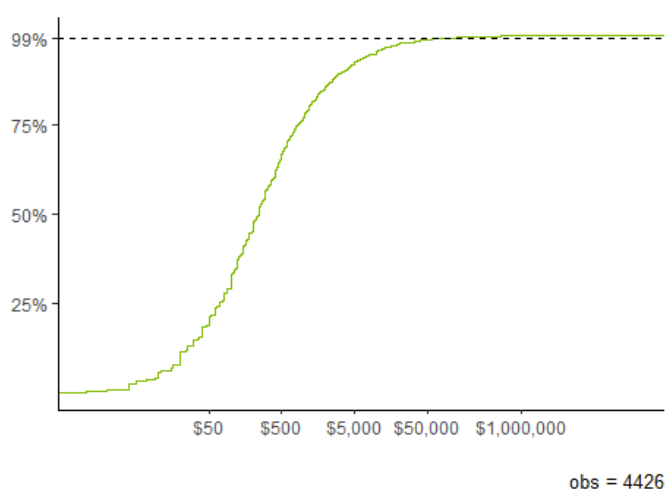
A.3 The impact of removing missing and extreme values

The removal of missing values and extreme values has resulted in a significant reduction in the number of observations in the sub-sampled used for the volunteering and giving analysis. As noted in Appendix A.1, it is necessary to check the composition of the four religiosity cohorts before and after the removal of these observations.

Table A.3 provides a breakdown of the final sample size by the four religiosity cohorts, with the percentage of each cohort within the respective samples in brackets.

Table A.3 Final sample size for the four religiosity cohorts

	Original sample	Volunteering sub-sample	Giving sub-sample	Original sample (excluding missing religiosity status)
N -> N	1494 (19%)	1233 (25%)	1081 (25%)	1494 (24%)
Y -> N	1711 (22%)	1439 (29%)	1288 (29%)	1711 (28%)
N -> Y	181 (2%)	140 (3%)	127 (3%)	181 (3%)
Y -> Y	2766 (36%)	2136 (43%)	1885 (43%)	2766 (45%)
missing	1604 (21%)	0 (0%)	0 (0%)	-
Total	**7756 (100%)**	**4948 (100%)**	**4381 (100%)**	**6152 (79%)**

At a first glance, it might appear that the percentage of religious cohorts (N->Y and Y->Y groups) is significantly higher in the volunteering/giving sub-samples than in the original sample.

However, this is in part attributable to the fact that the original sample includes 1,604 responses (21%) which did not answer the religiosity status question (labelled as "missing"). Consequently, the appropriate comparison should be drawn between the percentages of religiosity cohorts in the two sub-samples with the percentages from the original sample, excluding observations that did not answer the religiosity question, in the rightmost column.

Comparing the volunteering and giving sub-samples to the composition of the original sample excluding missing religiosity status, it is clear that the removal of extreme observations and missing values has not materially affected the composition of the religiosity cohorts in the sample. In other words, the occurrence of extreme/missing values do not appear to be correlated with religiosity status. Thus, the removal of these observations are not likely to introduce a bias into the econometric analysis.

A.4   Weighting of the sample data

Given the purpose of the analysis is to estimate the economic impact of religiosity to the Australian economy, it is essential that the results are based on a sample that is representative to the Australian population in terms of general demographics of age, gender and state of residence.

In reality, it is rarely the case that the distribution of age/gender/state in the sample will exactly match that from the population. The statistical procedure to adjust for this is to apply "weightings" to the sample such that the weighted marginal distributions in the sample match with the known population margins. We have used the *rake* function from the R package *survey*[6] to calculate the weightings for both of the sub-samples.

As an illustration, Figure A.1 compares the sample distribution of age (weighted and unweighted) with the ABS population distribution[7]. It can be seen that the original sample distribution is relatively lacking in the "38-48" cohort as well as the ">80" cohort, in comparison to the ABS distribution. After applying weightings, the weighted distribution resembles the ABS distribution much closely. The post-stratification weightings are derived iteratively to make sure that the marginal distribution of age, gender and state of residence are all similar to the marginal distribution from ABS.

Figure A.1 Illustration of sample weightings: the distribution of age
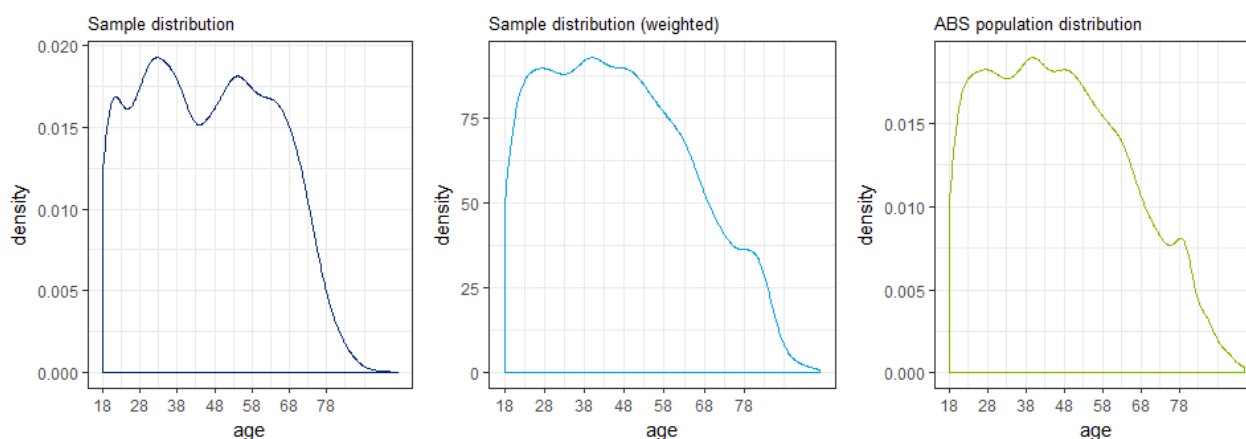
Although applying weightings is a standard statistical procedure to align sample distribution with the population, care should be taken on observations with exceptional high weightings, because high weightings suggest that the underlying observations are under-represented in the sample. Ideally the weightings should reside in the proximity of 1. This is verified in Chart A.3 below. We note that all of the observations associated with weightings greater than 3 are people over 80 years old. The under-representation of this age cohort is not surprising and should not have material impact on the representativeness of the weighted sample.

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[6] The "rake" function uses post-stratification to match marginal distributions of a survey sample to known population margins.
[7] Observations under 18 years old are removed from the ABS data for the purpose of this weight calculation. Because the survey does not have observations under 18 years old.

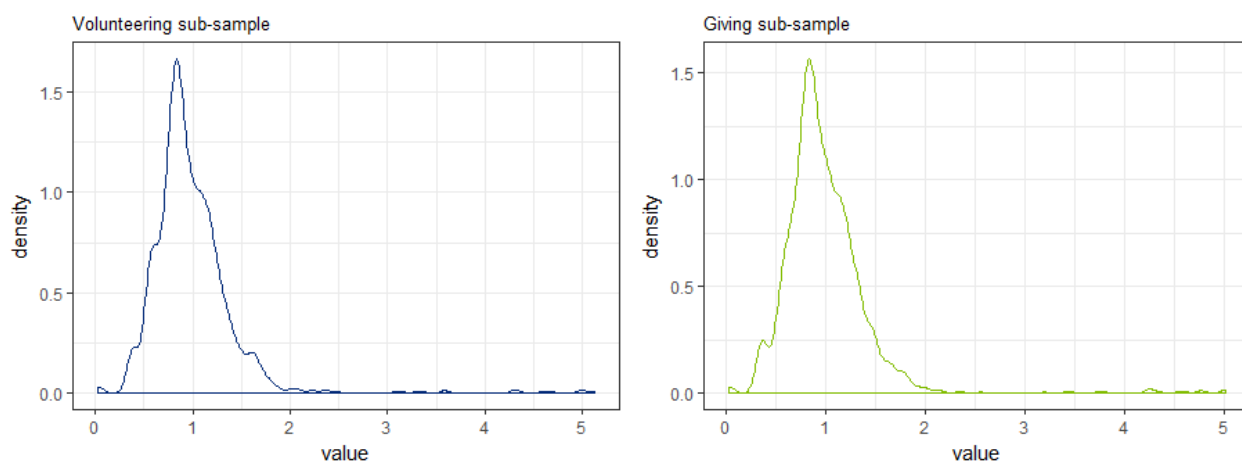Chart A.3 Distribution of sample weightings in the two sub-samples

Table A.3 also shows that the currently religious cohort (N->Y and Y->Y) represents below 50% of the observations in the weighted sample. In contrast, ABS reported in 2012 that 68.3% of the Australian population have a religious affiliation (ABS 2012). This raises the question as to whether the religious cohort in the population is under-represented in the sample. Nevertheless, given the ABS data are survey-based and for a different purpose and the questions were asked in a different manner[8], it is not surprising that these figures have not aligned perfectly.

It is generally not appropriate to weight the sample on a feature related to the dependent variable, rather only general population characteristics. Appendix C provides a sensitivity check on the econometric analysis with regard to a different set of weightings that also takes into account the marginal distribution of religiosity in the population. The conclusion is that our results are not sensitive to the change in the applied weightings.

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[8] The survey asked "what religion or denomination were the services you attend?"; while ABS asked "What is the person's religion?"

Appendix B: Econometric analysis

B.1 Hypothesis development

The goal of the econometric analysis is to determine whether religiosity delivers economic benefits which could be quantified. We wanted to approach this by testing hypotheses on two key areas of interest:

- Volunteering
  - Hypothesis 1A (null): There is no statistically significant difference between religious and non-religious people, in terms of their likelihood of volunteering for non-religious purposes, all other things being equal
  - Hypothesis 1B (null): There is no statistically significant difference between religious and non-religious volunteers, in terms of the time devoted to volunteering for non-religious purposes, all other things being equal

If either hypothesis 1A or hypothesis 1B is rejected in favour of the alternative hypothesis that religious people are more likely to volunteer/religious volunteers devote more time, then we could conclude that religious people contribute to the broader economy and society because they volunteer more than non-religious people for non-religious purposes, and this volunteering effort is associated with an economic benefit.

- Giving/donating
  - Hypothesis 2A (null): There is no statistical difference between religious and non-religious people, in terms of the likelihood of giving for non-religious purposes, all other things being equal
  - Hypothesis 2B (null): There is no statistical difference between religious and non-religious donors, in terms of the value of their donation for non-religious purposes, all other things being equal

If either hypothesis 2A or hypothesis 2B is rejected in favour of the alternative hypothesis that religious people are more likely to donate/religious donors donate higher value, then we could conclude that religious people contribute to the broader economy and society because they donate more than non-religious people for non-religious purposes, and this additional donation is associated with an economic benefit.

B.2 Logit regression (for hypothesis 1A & 2A)

Logit regression, also called a logit model, is a standard statistical technique to model binary outcome variables – that is, it can only take two values, "0" and "1", which in our context represent outcomes such as volunteer/not volunteer and donor/non-donor(for non-religious purposes). Specifically, the model calculates the log odds of volunteering/giving as a linear combination of other factors including age, gender and religiosity.

The probability of volunteering and giving is modelled separately in the two corresponding sub-samples:

$$\ln\left(\frac{P_i^{Volunteering}}{1 - P_i^{Volunteering}}\right) = \beta_0 + \beta_1 x_{1,i} + \cdots + \beta_m x_{m,i} + \epsilon_i$$

$$\ln\left(\frac{P_i^{Giving}}{1 - P_i^{Giving}}\right) = \gamma_0 + \gamma_1 z_{1,i} + \cdots + \gamma_m y_{m,i} + \eta_i$$

where P_i is the probability of volunteering/giving; $x_{i \sim m}$ and $z_{i \sim m}$ are factors that could affect a person's probability of volunteering/giving (see details in Table C.2).

One of the key challenges is to define what we call a 'treatment effect'. To put it differently, the model is designed to estimate the change in an average person's behaviour if he/she is not currently religious but were to become religious.

As discussed in Sections 2.4, 3.1 and 4.2, controlling for other factors is important because a range of characteristics may be correlated with both religiosity and volunteering/giving behaviour.

Some of these attributes are measured through the survey, and have been controlled for explicitly. However, individuals may have other individual characteristics (such as altruism) which cannot be easily measured. We partially control for this by focusing on the impact of changing a person's religious status on his/her volunteering and giving behaviour. In addition, the modelling should control for a range of other factors which could explain this behaviour, such as income, age, gender and whether the family were volunteers.

To define the key measure of religiosity, we consider two options in the data; namely, whether an individual attends religious services, and frequency of attendance. We find that changes in attendance over time and frequency of attendance are highly correlated; that is, people who transition from not attending religious services to attending religious services are much more likely to report attending services on a frequent basis, and vice versa. Intuitively, this is because both changes in attendance and frequency of attendance are associated with the underlying characteristic (namely religiosity) that we are seeking to measure.

This degree of interdependence, however, can be problematic for statistical analysis. Two highly correlated variables can lead to inaccurate estimations, because it is difficult to determine which variable is causing a change.

As such, we use only one measure of religiosity in the analysis. We have chosen to use attendance (rather than frequency) as the measure of religiosity for the following reasons.

- **Consistency**: Some previous literature quantifying the degree of religiosity in the Australian population (see above) uses participation in religious groups or services as a measure of religiosity.
- **Objectivity**: Respondents could nominate a number of frequencies of attendance (for example, never, weekly, monthly, annually). Different religious groups also have different expectations regarding attendance. There is no evidence upon which to base a 'cut-off' frequency above which an individual is considered religious. For example, is someone religious if they attend services once a month? Are they religious if they attend once a year?

As such, the key predictor in the regression is a categorical variable for religious attendance that takes the following four possible values:

- N->N: No religious attendance when growing up, no religious attendance now;
- Y->N: Had religious attendance when growing up, no religious attendance now;
- N->Y: No religious attendance when growing up, has religious attendance now;
- Y->Y: Had religious attendance when growing up, has religious attendance now;

This "religiosity status" variable is derived from Q27 in the survey, pictured below.

Figure B.1: Defining religiosity

| 27.	When you were growing up, what religion or denomination were the services you attended? And if you attend now, what religion or denomination do you attend most frequently now?	When growing up (around 11 years old)	Now, as an adult
	I did not / do not attend	O	O
	Anglican (Church of England)	O	O
	Baha'i	O	O
	Baptist	O	O
	Buddhist	O	O
	Catholic	O	O
	Churches of Christ	O	O
	Hindu	O	O
	Jehovah's Witness	O	O
	Jewish	O	O
	Latter-day Saints (Mormon)	O	O
	Lutheran	O	O
	Muslim	O	O
	Orthodox *(eg Greek, Russian, Coptic)*	O	O
	Pentecostal *(eg Hillsong, Assemblies of God)*	O	O
	Presbyterian or Reformed	O	O
	Seventh-day Adventist	O	O
	Sikh	O	O
	The Salvation Army	O	O
	Uniting (or Methodist or Congregational)	O	O
	Other *(. . . please explain in question 28)*	O	O

Source: SEIROS survey

The "treatment effect" would be the estimated difference in the probability of volunteering/giving between the "N->N" cohort and the "N->Y" cohort, for an average person. Such "average person" would have the average characteristics from the sample in terms of other predictors such as age, gender, income, education level, etc. In addition, we note that there are two options by which religiosity can be defined:

- Q27: They identify as having attended religious services of any denomination; or
- Q26: The frequency with which they attend services or events.

We explored both in the analysis. As discussed in Section 2.4.1 and pictured in Figure B.2, we found that the two variables are highly correlated. As such, it is appropriate to retain only the religious status variable derived from Q27. The ring chart on the left shows the distribution of "religiosity status" in the sample, and the bar chart to the right shows that most religious people do attend religious activities.

Figure B.2 Correspondences between the answer to question 27 and 26

N = 7756
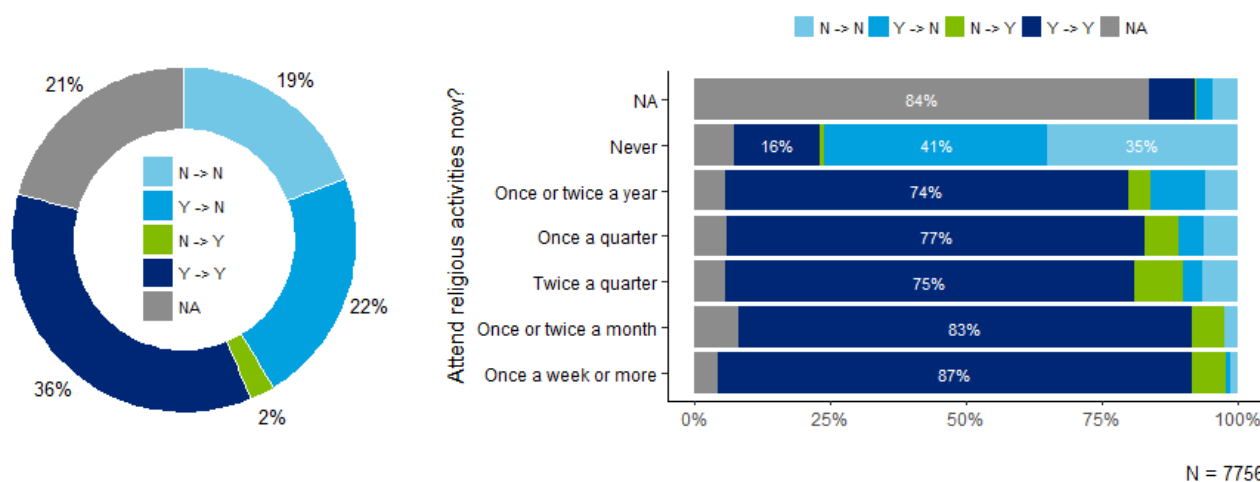
The omission of the variable from Q26 means that the effect of how frequent a person attend religious service/event will be partially absorbed by the religious status variable through their strong correlation. This also avoids the problem of arbitrarily defining how frequent a "religious" person should attend religious activities.

B.3　Ordinary least squares (OLS) regression (for hypothesis 1B & 2B)

The simple ordinary least squares (OLS) regression are used to explore whether a statistically significant difference exists between the hours volunteered/amount donated (for non-religious purposes) from volunteers/donors in the different religiosity cohorts. The parameterisation of the model is similar to the logit regression except that the dependent variable becomes the log of hours volunteered/amount donated:

$$\ln(Hours\ volunteered_i) = \beta_0 + \beta_1 x_{1,i} + \cdots + \beta_m x_{m,i} + \epsilon_i$$

$$\ln(Amount\ donated_i) = \gamma_0 + \gamma_1 z_{1,i} + \cdots + \gamma_m y_{m,i} + \eta_i$$

This analysis is only concerned with people who have volunteered for some hours or donated some amount in the last 12 months. Therefore, observations with zero hours/amount has been removed. This ensures that the variables inside the log function are all positive.
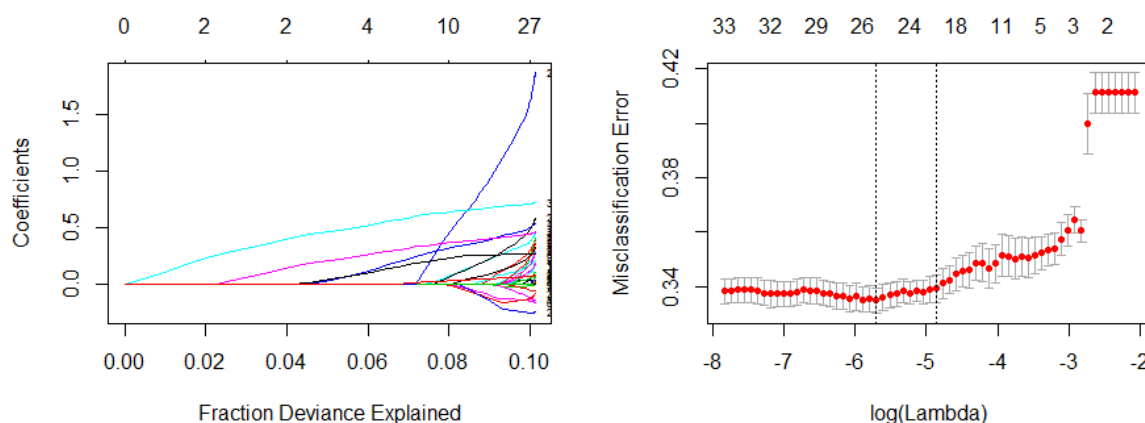
Appendix C: LASSO regularisation

Judgement is required to select predictors for the logit and OLS regression. Although it is intuitive to include variables such as age, income, education, a robust statistical approach is desired to test the appropriateness of the included variables.

To do this, we utilise a regularised regression technique known as the "least absolute shrinkage and selection operator" (LASSO). The method is designed to perform both variable selection and regularisation in order to enhance the prediction accuracy and interpretability of the statistical model.

For the purpose of the analysis in this report, the LASSO method is used only as a tool for variable selection. It is superior to other variable selection methods such as stepwise regression. To illustrate the method, Figure C.1 below demonstrates the variable selection process from the LASSO regression of the logit model described for the volunteering analysis. The lines in the left chart shows the increase in the fraction of deviance explained as the coefficient of the variables in the model increases (each line represents a coefficient for a variable); and the chart on the right shows how the misclassification error decreases as the number of predictors increases[9].

Figure C.1 Illustration of the LASSO method for the volunteering logit regression

We have used the *glmnet* package in R to perform the LASSO regression, which optimises the regularisation parameter (lambda) to minimise the mean cross-validated error. The selected variables for the two analysis are shown in Table C.2 below.

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[9] Each red point represents a different model outcome lined up by the number of predictors; Lambda on the bottom horizontal axis is the regularisation parameter; the numbers on the top horizontal axis shows the number of variables in the corresponding model.

Table C.2 Selected variables for the regression analysis

Variable label in the regression	Variable	Levels
Status	Religious status	N->N; Y->N; N->Y; Y->Y
DAGEGP	Age group	18 to 35; 35 to 54; 55 years +
DSEX	Gender	Male; Female
DEDLEVEL	Education level	Primary; Secondary; Trade certificate; Diploma; Bachelor degree; Post-graduate degree
BUSY	Busy	Numeric level: 1-10
DEMPLOY	Employment	Full-time; Home duties; On leave; Part-time; Retired; Self-employed; Studying; Unemployed; Working without pay; Other
DINCOME	Income	Less than $800; $800 to $1300; $1300 to $1800; $1800 to $2800; Over $2800 (per week)
DHEALTH	Health	With difficulties; No difficulties; Don't know
GUPARVOL	Parents volunteering	Yes; No
GUVOL	Volunteered in school	Yes; No
GUVOLRELIG	Volunteered in religious organisation	Yes; No

Appendix D: Volunteering results

D.1   Logit model

Table D.1 below shows the coefficients from the logit regression with the dummy of whether the person has volunteered for non-religious purposes or not as the dependent variable. It can be seen that the key coefficient, *status: N->Y*, is statistically significant at 1% (p-value less than 0.01).

Table D.1 Coefficients from the logit model for the volunteering analysis

Variable	Estimate	Std. Error	z value	Pr(>|z|)	Signif
(Intercept)	-2.3530201	0.2599709	-9.051	< 2e-16	***
statusY -> N	0.0696417	0.0890797	0.782	0.434338	
statusN -> Y	1.0110264	0.193482	5.225	1.74E-07	***
statusY -> Y	0.4777009	0.0848684	5.629	1.82E-08	***
DAGEGP35 to 54	-0.1300501	0.0840982	-1.546	0.122006	
DAGEGP55 years +	0.1554634	0.1083737	1.435	0.151426	
DSEXMale	-0.0050743	0.067233	-0.075	0.939838	
DEDLEVELSecondary	0.155427	0.1252214	1.241	0.214525	
DEDLEVELTrade certificate	0.1513762	0.1330739	1.138	0.255315	
DEDLEVELDiploma	0.2675135	0.1309335	2.043	0.04104	*
DEDLEVELBachelor degree	0.3677184	0.1294799	2.84	0.004512	**
DEDLEVELPost-graduate degree	0.5353655	0.1471411	3.638	0.000274	***
BUSY	0.0893181	0.0180279	4.954	7.25E-07	***
DEMPLOYHome duties	0.0116841	0.1249601	0.094	0.925504	
DEMPLOYOn leave	0.3950288	0.2879662	1.372	0.170129	
DEMPLOYOther	-0.0874805	0.212574	-0.412	0.680684	
DEMPLOYPart-time work	0.2694029	0.1029236	2.618	0.008858	**
DEMPLOYRetired	0.240475	0.1269031	1.895	0.058099	.
DEMPLOYSelf-emplpoyed	0.548194	0.1376529	3.982	6.82E-05	***
DEMPLOYStudying	0.4496787	0.1357359	3.313	0.000923	***
DEMPLOYUnemployed	0.197415	0.1587877	1.243	0.213771	
DEMPLOYWorking without pay	1.9387399	0.4202646	4.613	3.97E-06	***
DINCOME$800 to $1300	-0.0009848	0.0913907	-0.011	0.991402	
DINCOME$1300 to $1800	0.129504	0.1067701	1.213	0.225159	
DINCOME$1800 to $28800	0.0309794	0.1181404	0.262	0.793148	
DINCOMEOver $2800	0.3780794	0.1425981	2.651	0.008017	**
DINCOMEDon't know	-0.0395821	0.1093267	-0.362	0.717312	
DHEALTHNo difficulties	0.1149308	0.177178	0.649	0.516549	
DHEALTHWith difficulties	0.0756463	0.1833037	0.413	0.679839	
GUPARVOLTRUE	0.7806505	0.0681434	11.456	< 2e-16	***
GUVOLTRUE	0.3596573	0.070929	5.071	3.96E-07	***
GUVOLRELIGTRUE	0.5706719	0.0782839	7.29	3.10E-13	***

Signif codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

The coefficient 1.01 on the dummy variable "N->Y" means that the odds of volunteering are about triple[10] as much for people who were not religious but become religious than those who were never religious. Predictions and interpretations based on odds ratios are far less intuitive than probabilities. Therefore, we use the *effects* package from R to calculate the estimated difference in the probability of volunteering for an average person in the weighted sample.

Chart D.1 below shows the predicted probability of volunteering for an average person in the four religiosity cohorts. It can be seen that the dots for the "N->Y" cohort is distinctly higher than that for the "N->N" group. The model predicts that people who were never religious have an average probability of 38.1% to volunteer, compared with 62.8% for people become religious. The difference is 24.75 in percentage points.

Chart D.1 Effect plot for the religiosity status variable in the volunteering logit regression
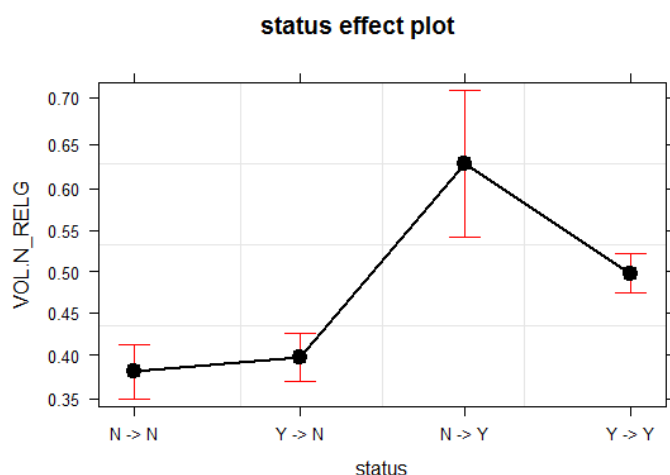

Arguably, religiosity status is not the only factor that has a statistically significant impact on the probability of volunteering. In fact, the model predicts that:

- people in the 35-54 age group are less likely to volunteer;
- people with higher income/education levels are move likely to volunteer; and
- people with volunteering experience in school/with parents are more likely to volunteer.

The effect plots of these variables are shown in Figure D.1 below:

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[10] $e^{1.01}e^0 = 2.75$

Figure D.1 Effect plots for other significant variables in the logit model for volunteering
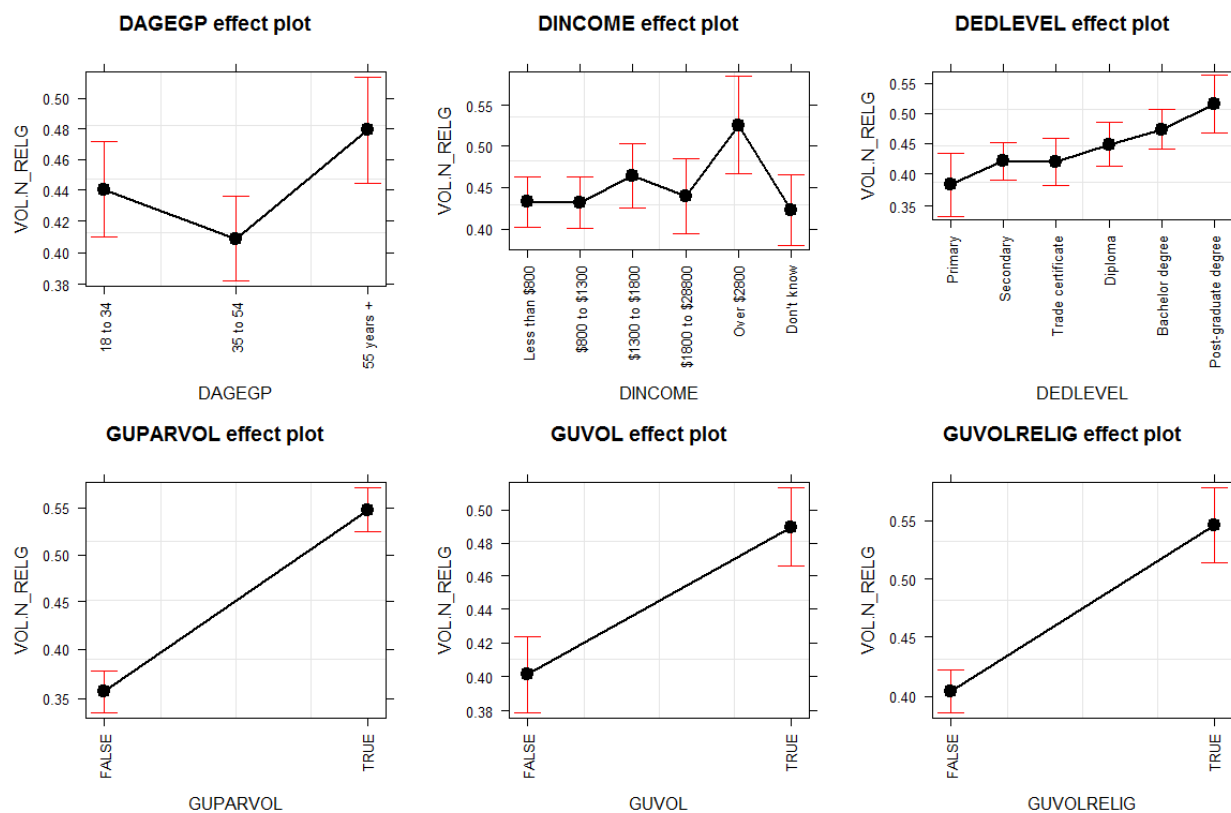
As some of the predictors in the model can be highly correlated (e.g. education and income), it is important to check the stability/variance of the estimated coefficients by looking at their Variance Inflation Factor (VIF). VIF is an index that measures how much the variance of an estimated regression coefficient is increased because of collinearity. Table D.2 below lists the VIFs for the 11 variables included in the logit regression for volunteering. A rule of thumb is that if the VIF is above 10 then multicollinearity is high (Kutner, Nachtsheim & Neter 2004). The highest VIF in the model is 3.7 so our model does not suffer from the problem of multicollinearity.

Table D.2 Variance Inflation Factor (VIF) for the variables included in the volunteering logit model

	VIF
status	1.219154
DAGEGP	2.387632
DSEX	1.168321
DEDLEVEL	1.267952
BUSY	1.145853
DEMPLOY	3.696424
DINCOME	1.582851
DHEALTH	1.185034
GUPARVOL	1.199741
GUVOL	1.300534
GUVOLRELIG	1.271124

Therefore, we find evidence to reject the null hypothesis 1A. The uplift in the probability of volunteering for non-religious purposes is 24.75 in percentage points, for an average person who was not religious but becomes religious.

D.2   OLS model

Table D.3 below shows the coefficients from the logit regression with the log of hours volunteered for non-religious purposes as the dependent variable. It can be seen that the key coefficient, "status: N->Y", is **not** statistically significant at 1% (p-value = 0.75).

Table D.3 Coefficients from the OLS model for the volunteering analysis

	Estimate	Std. Error	z value	Pr(>|z|)	Signif
(Intercept)	1.432347	0.214367	6.682	3.00E-11	***
statusY -> N	-0.080598	0.07609	-1.059	0.289606	
statusN -> Y	-0.042263	0.130944	-0.323	0.746914	
statusY -> Y	-0.149299	0.069372	-2.152	0.031496	*
DAGEGP35 to 54	-0.089155	0.065465	-1.362	0.173383	
DAGEGP55 years +	0.032024	0.084169	0.38	0.703627	
DSEXMale	0.041816	0.051719	0.809	0.41888	
DEDLEVELSecondary	-0.058337	0.105824	-0.551	0.581509	
DEDLEVELTrade certificate	0.111149	0.112839	0.985	0.324722	
DEDLEVELDiploma	0.1888	0.108568	1.739	0.082176	.
DEDLEVELBachelor degree	-0.028875	0.106077	-0.272	0.785485	
DEDLEVELPost-graduate degree	0.061447	0.114721	0.536	0.592274	
BUSY	0.06936	0.015005	4.622	4.02E-06	***
DINCOME$800 to $1300	-0.177656	0.071421	-2.487	0.012942	*
DINCOME$1300 to $1800	-0.059393	0.08109	-0.732	0.463986	
DINCOME$1800 to $2800	-0.092234	0.090733	-1.017	0.309488	
DINCOMEOver $2800	-0.168138	0.104133	-1.615	0.106534	
DINCOMEDon't know	-0.122478	0.085974	-1.425	0.154419	
DEMPLOYHome duties	0.38872	0.099954	3.889	0.000104	***
DEMPLOYOn leave	0.294045	0.219034	1.342	0.179588	
DEMPLOYOther	0.507621	0.185657	2.734	0.006305	**
DEMPLOYPart-time work	0.218785	0.078773	2.777	0.005527	**
DEMPLOYRetired	0.336251	0.100325	3.352	0.000817	***
DEMPLOYSelf-employed	0.094737	0.101104	0.937	0.348851	
DEMPLOYStudying	0.158513	0.100931	1.571	0.116444	
DEMPLOYUnemployed	0.496885	0.130313	3.813	0.000141	***
DEMPLOYWorking without pay	0.718934	0.207601	3.463	0.000545	***
DHEALTHNo difficulties	0.033688	0.144553	0.233	0.815743	
DHEALTHWith difficulties	0.122773	0.148895	0.825	0.409712	
GUPARVOLTRUE	0.008018	0.05527	0.145	0.884675	
GUVOLTRUE	0.03764	0.056978	0.661	0.508938	
GUVOLRELIGTRUE	-0.104677	0.057179	-1.831	0.067284	.

Signif codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

Given there is no statistically significant relationship between religiosity and number of hours volunteered for non-religious purposes, we find no evidence to reject the null hypothesis 1B.

Appendix E: Giving results

Table E.1 shows the coefficients from the logit regression with the dummy of whether the person has donated to non-religious purposes or not as the dependent variable. It can be seen that the key coefficient, "status: N->Y" highlighted below, is statistically significant at 1% (p-value less than 0.01).

Table E.1 Coefficients from the logit model for the giving analysis

	Estimate	Std. Error	z value	Pr(>|z|)	Signif
(Intercept)	-2.30394	0.26575	-8.67	< 2e-16	***
statusY -> N	0.52281	0.08855	5.904	3.55E-09	***
statusN -> Y	**0.96076**	**0.1984**	**4.843**	**1.28E-06**	*****
statusY -> Y	0.78804	0.08178	9.636	< 2e-16	***
DAGEGP35 to 54	0.16919	0.08552	1.978	0.047891	*
DAGEGP55 years +	0.41924	0.11084	3.782	0.000155	***
DSEXMale	-0.41984	0.06939	-6.05	1.44E-09	***
DEDLEVELSecondary	0.40953	0.1241	3.3	0.000967	***
DEDLEVELTrade certificate	0.15476	0.13247	1.168	0.242702	
DEDLEVELDiploma	0.48514	0.13011	3.729	0.000193	***
DEDLEVELBachelor degree	0.65398	0.12996	5.032	4.86E-07	***
DEDLEVELPost-graduate degree	0.93852	0.15223	6.165	7.04E-10	***
BUSY	0.08198	0.01807	4.536	5.74E-06	***
DEMPLOYHome duties	-0.09504	0.12823	-0.741	0.458577	
DEMPLOYOn leave	-0.18221	0.28541	-0.638	0.523204	
DEMPLOYOther	-0.061	0.20785	-0.293	0.76917	
DEMPLOYPart-time work	0.02789	0.10794	0.258	0.796102	
DEMPLOYRetired	0.1842	0.1319	1.397	0.16256	
DEMPLOYSelf-emplpoyed	-0.31346	0.14234	-2.202	0.027654	*
DEMPLOYStudying	0.14768	0.13845	1.067	0.286118	
DEMPLOYUnemployed	-0.23857	0.15784	-1.511	0.130676	
DEMPLOYWorking without pay	0.73726	0.35915	2.053	0.040092	*
DINCOME$800 to $1300	0.3847	0.09217	4.174	2.99E-05	***
DINCOME$1300 to $1800	0.68578	0.1124	6.101	1.05E-09	***
DINCOME$1800 to $28800	0.71208	0.12384	5.75	8.94E-09	***
DINCOMEOver $2800	0.66833	0.14791	4.518	6.23E-06	***
DINCOMEDon't know	0.13565	0.11104	1.222	0.221841	
DHEALTHNo difficulties	0.72843	0.18538	3.929	8.52E-05	***
DHEALTHWith difficulties	0.82138	0.19159	4.287	1.81E-05	***

Signif codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

The coefficient 0.96 on the dummy variable "N->Y" means that people who transition from being non-religious (not attending services) to being religious (attending services) are around 1.5 times[11] more likely to give for non-religious purposes than those who remain non-religious, all else being equal. Consistent with the volunteering analysis, we use the "effects" package from R to derive the estimated difference in probability of giving for an average person.

Chart E.1 shows the predicted probability of giving for an "average person" in the four religiosity cohorts. It can been seen that the dots for the "N->Y" cohort is distinctly higher than that for the "N->N" cohort. The model predicts that people who were never religious have an average probability of 44.9% to donate, compared with 68.1% for people who transitioned to become religious. The difference is 23.15 in percentage point terms.

Chart E.1 Effect plot for the religiosity status variable in the volunteering logit regression
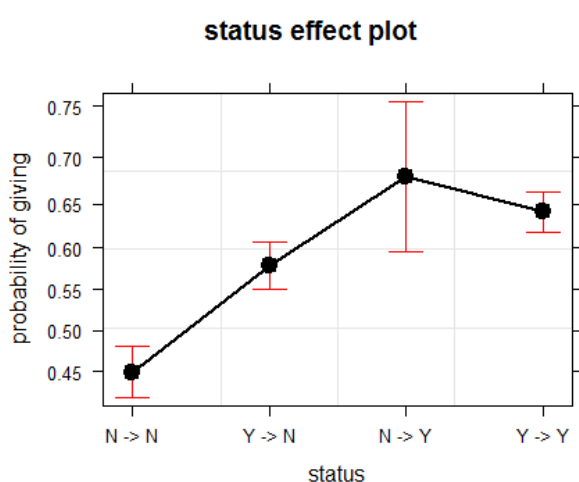
Similar to the volunteering analysis, we find that religiosity status is not the only factor that has a statistically significant impact on the probability of giving. In fact, the model predicts that:

- older people are more likely to donate;
- females are more likely to donate than males;
- people with higher incomes are more likely to donate; and
- people with higher education levels are move likely to donate.

The effect plots of these variables are shown in Figure E.1.

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[11] $e^{0.92} = 2.51$

Figure E.1 Effect plots for other significant variables in the logit model for giving
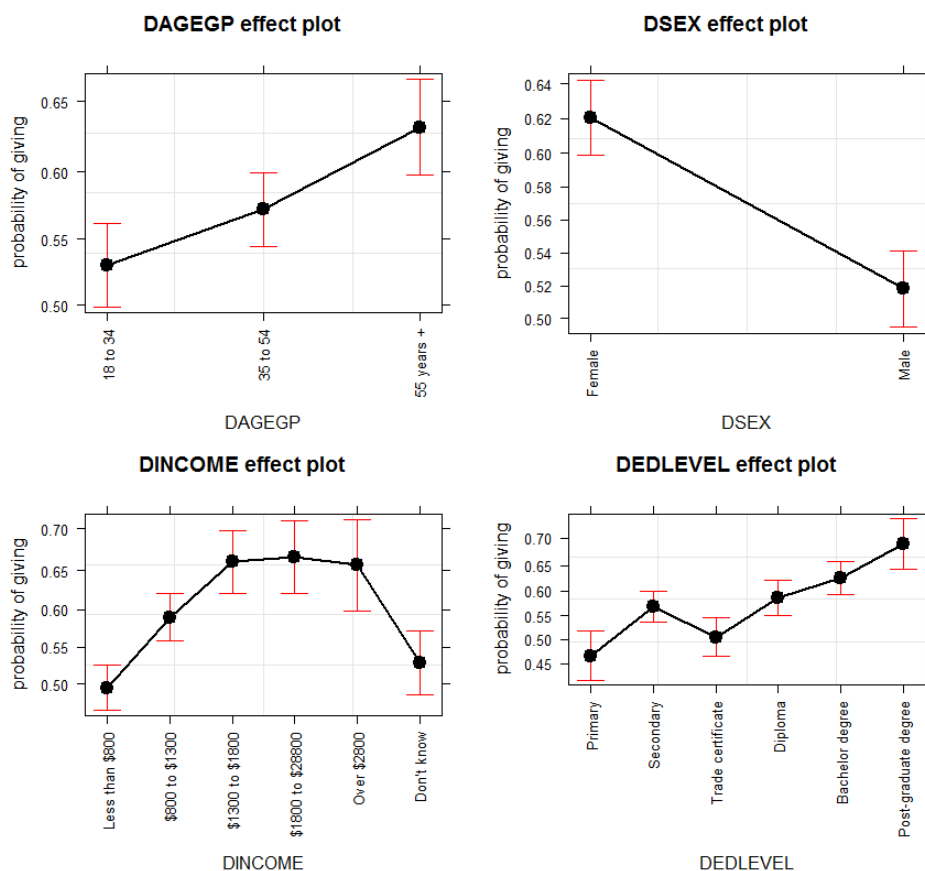
Similar to the volunteering analysis, Table E.2 lists the variance inflation factors for the 8 variables included in the logit regression for giving. The highest variance inflation factor in the model is 3.7, which suggests that the model does not suffer from the problem of multicollinearity.

Table E.2 Variance Inflation Factor (VIF) for the variables included in the volunteering logit model

	VIF
status	1.096048
DAGEGP	2.31948
DSEX	1.173324
DEDLEVEL	1.249329
BUSY	1.155863
DEMPLOY	3.704599
DINCOME	1.576434
DHEALTH	1.179439

Therefore, **we find evidence to reject the null hypothesis 2A**. The uplift in the probability of giving for non-religious purposes is 23.15 in percentage points, for an average person who was not religious but becomes religious.

E.2   OLS model

Table E.3 below shows the coefficients from the logit regression analysis for the probability of giving. It can be seen that the key coefficient, "status: N->Y", is **not** statistically significant at 1% (p-value = 0.86).

Table E.3 Coefficients from the OLS model for the volunteering analysis

	Estimate	Std. Error	z value	Pr(>|z|)	Signif
(Intercept)	3.8687928	0.3420916	11.309	< 2e-16	***
statusY -> N	0.1228014	0.1077386	1.14	0.25448	
statusN -> Y	-0.0364607	0.2038125	-0.179	0.85804	
statusY -> Y	0.2435643	0.0983605	2.476	0.01334	*
DAGEGP35 to 54	0.395852	0.0968635	4.087	4.52E-05	***
DAGEGP55 years +	0.5581109	0.1232727	4.527	6.26E-06	***
DSEXMale	-0.3970514	0.0763563	-5.2	2.16E-07	***
DEDLEVELSecondary	-0.1483719	0.1526261	-0.972	0.33108	
DEDLEVELTrade certificate	-0.0168039	0.1653373	-0.102	0.91906	
DEDLEVELDiploma	0.2544423	0.1568532	1.622	0.1049	
DEDLEVELBachelor degree	0.2130076	0.1545815	1.378	0.16834	
DEDLEVELPost-graduate degree	0.4759035	0.16799	2.833	0.00465	**
BUSY	0.0397676	0.0214286	1.856	0.0636	.
DEMPLOYHome duties	-0.1600934	0.142596	-1.123	0.26167	
DEMPLOYOn leave	0.0805216	0.3278861	0.246	0.80603	
DEMPLOYOther	-0.0956805	0.2469386	-0.387	0.69844	
DEMPLOYPart-time work	0.0460904	0.1167325	0.395	0.693	
DEMPLOYRetired	-0.0223459	0.1440633	-0.155	0.87675	
DEMPLOYSelf-emplpoyed	0.1660892	0.1649428	1.007	0.31406	
DEMPLOYStudying	-0.1393525	0.1564688	-0.891	0.37323	
DEMPLOYUnemployed	-0.2348888	0.1970757	-1.192	0.23343	
DEMPLOYWorking without pay	0.0002642	0.3328798	0.001	0.99937	
DINCOME$800 to $1300	0.437352	0.1049898	4.166	3.21E-05	***
DINCOME$1300 to $1800	0.3656936	0.1229676	2.974	0.00297	**
DINCOME$1800 to $28800	0.5918106	0.1308917	4.521	6.44E-06	***
DINCOMEOver $2800	0.7672781	0.1554858	4.935	8.57E-07	***
DINCOMEDon't know	0.1984403	0.1332139	1.49	0.13645	
DHEALTHNo difficulties	0.1371466	0.2521301	0.544	0.58652	
DHEALTHWith difficulties	0.259462	0.2568175	1.01	0.31245	

Signif codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

Given there is no statistically significant relationship between religiosity and the amount of giving for non-religious purpose, we find no evidence to reject the null hypothesis 2B.

E.3 Economic benefit

E.3.1. Calculation of benefit

Our econometric analysis has found evidence to support Hypotheses 1A and 2A, that is:

- Religious people are more likely to volunteer to help the broader (i.e. non-religious) community than non-religious people, all other things being equal; (24.75 percentage point uplift in probability)
- Religious people are more likely to donate to the broader (i.e. non-religious) community than non-religious people, all other things being equal; (23.15 percentage point uplift in probability)

To derive the economic benefit to the Australian economy, the estimated uplift in probabilities needs to be applied to the proportion of the religious cohort in the population and the average volunteering hours/donation amounts. Table E.4 below calculates the annual economic contribution in terms of the extra volunteering hours and donations from religious people for non-religious purposes.

Table E.4 Economic benefit of religiosity in terms of volunteering hours and donation to non-religious purposes

Volunteering hours per month (excluding for religious purposes)			Population base and uplift in probability			Annual contribution	
Sample	Average hours from volunteers	Percentage of volunteers	AU adult population 2016 (million)	Religious cohort (N->Y)	Uplift in probability of volunteering	Annual contribution (millions of hours)	% of total volunteering hours
SEIROS	13.08	45%	18.72	4.19%	24.75%	**30.5**	**2.35%**
Donation amount per year (excluding for religious purposes)			Population base and uplift in probability			Annual contribution	
Sample	Average donation from donors	Percentage of donors	AU adult population 2016 (million)	Religious cohort (N->Y)	Uplift in probability of donating	Annual contribution ($million)	% of total donation amount
SEIROS	$781.18	57%	18.72	4.19%	23.15%	**141.99**	**1.71%**

To explain how economic contribution is calculated in Table E.4, the table is divided into 3 blocks.

- The left block shows the average volunteering hours/donations amounts with and without excluding the 0 observations (i.e. people who have not volunteered or donated) from the SEIROS sample.
- The middle block shows the population base and the uplift in probability.
  - The preliminary estimated resident population (ERP) of Australia at 30 September 2016, obtained from the ABS website, is 24.22 million;
  - We then calculates the adult population by multiplying the total AU population by the percentage of people greater than or equal to 18-years-old (77.3%) as reported in the ABS census 2011;
  - The religious cohort (to apply the uplift) is calculated as the product of the 68.3% total religious population and the 6.14% share of "converted" people (N->Y in the model) within the religious cohort based on the SEIROS sample (ABS 2011b).
- Finally, the right block calculates the annual contribution in terms of extra volunteering hours/donation amounts based on the left and middle block. To illustrate, the 30.5 extra volunteering hours based on the ABS sample averages is calculated as the product of:
  - Uplift in probability of volunteering = 24.75%;
  - Religious cohort size in the adult population – 4.19% * 18.72 = 0.784
  - Average volunteering hours per year (excluding 0 values) – 13.08 * 12 = 156.96

The contribution amount from giving is calculated accordingly.

E.3.2. Validation of benefit with ABS data

We have relied on the average volunteering hours and donation amount from our weighted sample in deriving the annual economic contribution in the previous section. It is worthwhile to check if the weighted averages from the SEIORS sample are consistent with the similar survey data released by the ABS. In particular, we look at reported volunteering hours from the General Social Survey (GSS) 2014 and donation amount from the Household Expenditure Survey (HES) 2011a.

Table 4.8 compares the average volunteering hours and donation amount (excluding for religious purposes) from the weighted SEIROS sample.

Table 4.8 Comparison of the average volunteering hours (non-religious) and donation amount (non-religious) between the weighted SEIROS sample and the ABS release

		Average hours/donation from volunteers/donors	Percentage of volunteers/donors
Volunteering hours	ABS	8.56	31%
	Weighted SEIROS	13.08	45%
Donation amount	ABS	$1,294.34	3%
	Weighted SEIROS	$781.18	57%

For volunteering, the average volunteering hours from the weighted SEIROS sample appears higher than that from the ABS. However, we note that:
- ABS has collected the volunteering hours from volunteers up to 3 organisations in the last 12 months, but noted that 4.9% of the volunteers worked for more than 3 organisation in 2014 (ABS, 2014). This would also contribute to the lower percentage of volunteers in ABS (31%) than SEIROS (45%).
- The reported figure above has completely excluded the ABS volunteering hours devoted to religious organisations, as ABS does not ask whether the work done for the religious organisations are for the wider benefit of the public (whereas the SEIROS sample asked explicitly in question 20).

For our analysis, it is not appropriate to exclude people who have done volunteer work for more than 3 organisations; and the voluntary hours devoted through religious organisations but for the benefit of wider public should also be included. Therefore, we have relied on the weighted SEIROS sample to calculate the contribution value from the uplift in the probability of volunteering for religious people.

For giving, the average annual donation amount from donors is much higher in the HES sample. However, we note that the survey methodologies from HES is very different to the SEIROS survey:
- The SEIROS survey asks explicitly about the amount of donation in the last 12 month;
- The ABS HES asks about the amount of donation in a 2 week period, but collected from different people across a full year.

It is not easy to reconcile the two methods. The two-week window question from HES is designed to measure the amount of donation from donors, rather than the percentage of donors in the population. Because respondents who have not donated during the two-week period before are likely to have donated in another occasion earlier in the year. As a result, the percentage of donors in HES is only 3%, compared with 57% from the weighted SEIROS sample. The reported figure from ABS above is also associated with large Relative Standard Error (RSE) at 15.6% because it is calculated from only 324 donors. In light of these, we have decided to use the lower average donation figure from SEIROS to provide a conservative estimates for the analysis.

In conclusion, we have used the average volunteering hours and donation amount both from the weighted SEIROS sample. The reason for not using the GSS or HES is that considering the different collection methodologies and the statistical error of the GSS/HES and the SEIROS estimates the SEIROS estimates can be considered to be in keeping with the HES as a point of reference.

Appendix F: Sensitivity of the weighting of sample

The key conclusions from the econometric analysis are:

- **Religious people are more likely to volunteer** to help the broader (i.e. non-religious) community than non-religious people, all other things being equal; (24.75 percentage point uplift in probability)
- **Religious people are more likely to donate** to the broader (i.e. non-religious) community than non-religious people, all other things being equal; (23.15 percentage point uplift in probability)

Section A.4 noted that these results are based on a weighted version of the SEIROS sample, with weights based on the marginal distribution of age, gender and state of residence from the ABS census data.

However, the proportion of people designated as religious (i.e. attending religious services) is significantly lower in the weighted sample (below 50%) than the population (68.3%). In light of this, this section is devoted to a sensitivity test on a new set of weightings that take into account the marginal distribution of the religious affiliation according to the Census.

Figure F.1 compares the distribution of weightings in the two sub-samples. The dark blue density curves are the weightings used in the analysis per Appendix C, while the green density curves are weightings that would need to apply to make the weighted sample have the same incidence of religiosity as ABS statistics.

Figure F.1 Comparison of weightings in the sensitivity analysis
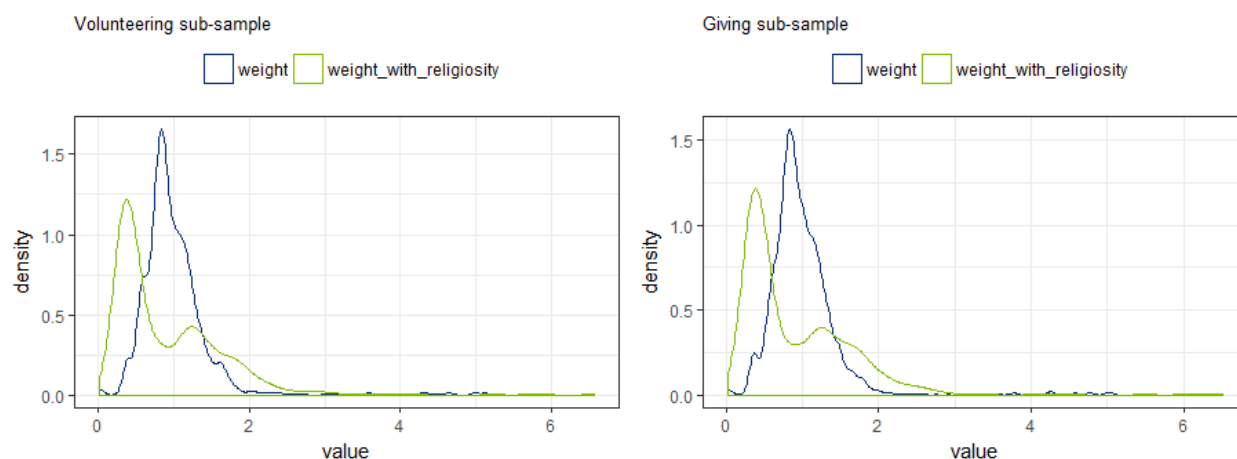
The same logit regressions were run based on the new weightings. Table F.2 compares the estimated coefficients and the implied uplift in probabilities. It can be seen that the difference between the results from the original and new weightings is not material. Therefore, our analysis is not sensitive to whether the weightings take into account the marginal distribution of religiosity.

Table F.2 Comparison of results for the sensitivity analysis

	Coefficients on N->Y		Uplift in probability	
	Original weightings	**New weightings**	**Original weightings**	**New weightings**
Volunteering	1.01	1.03	24.75%	25.24%
Giving	0.96	0.92	23.15%	22.32%

Appendix G: The survey

Limitation of our work