- Paper Replication -
The Effect of Income on Religiousness
ECON 435 - Econometrics - SFU

Barinder Thind

301193363

Abstract

This is a replication of the paper *The Effect of Income on Religiousness* authored by Thomas Buser[1]. The replication is for a term paper for an applied economics class. As far as the paper is concerned, the author looked for a causal connection between how religious a family is and how much money they make. More details will be provided below however, as an overview, it was found that families that earn more also tend to go to church more often and were more likely to become protestant.

Keywords: RDD, Regression, Instrument, Income, Religiousness

I. Introduction

The paper attempts to answer three main questions which include:

- As people gain wealth, do they become more or less religious?

- Are people converting to different religions as they become more wealthy?

- How is church attendance affected by an increase in income?

These are important questions because they have a significant impact on the way that a society will develop. This is because, since religion contains a set of ideas and views of the world, if the rich in a given population tend

---

[1]Thomas is currently an assistant professor at the University of Amsterdam

towards a particular religion, then the policies and laws that govern such a location are more likely to be influenced by that religion. This follows from the assumption that the more well-off and upper class families have more of an influence on legislative issues and also from the fact that most of the people making these decisions will be coming from these wealthier families. Therefore, since the affect of this relationship would be rooted at the heart of the democratic process, it is, almost without a doubt, a very important topic to explore.

II. Data Description

Personally, I obtained the data from the *American Economic Journal* [2] website. The data itself was originally collected from the SELBEN II[3] data set by randomly sampling households from poor neighborhoods (Guayaquil, Quito, and Santo Domingo). The sampling frame consisted of families that only received a government transfer once[4], that were in one of the previously mentioned neighborhoods, and that were following the program in accordance to its rules before the shift occurred[5].This data is relevant because now we have a way of making a comparison between each family before and after a change in income in regards to their religiousness. The following is what my replication of table 1 looked like:[6]

```
                                              Freq
Eligibility: before - no, after - yes    670
Eligibility: before - yes, after - no    653
Eligibility: before - yes, after - yes   674
Eligibility: before - no, after - no     648
```

Figure 1: [1]. Reproduction of table 1 in the paper. The totals are found by summing across appropriate rows.

---

[2]https://www.aeaweb.org/articles?id=10.1257/app.20140162

[3]This is an index which is calculated using PCA which takes into account a variety of factors to determine the wealth status of a family

[4]This transfer is known as the BDH and is part of a government program that helps the poorest 40% of Ecuadorian families

[5]In 2009, there was a change in the index from SELBEN to SELBEN II. This change in index resulted in some families moving in (and out) of the 40th percentile

[6]Attached will also be and .Rmd file and an HTML file which will show you the exact code required to produce each of these tables. In the caption of each table, I will provide a number which corresponds to the numbers in the .Rmd file

Moving on, we get to the table of the descriptive statistics. This is the second table in the paper. The INEC data was omitted as we were only looking at our own sample frame here. I split the descriptive tables into two sub-tables as below:

```
                                      Freq  Percentage
Religion - Catholic                   1971  74.51795841
Religion - Non-Catholic Christian      452  17.08884688
Religion - Jewish                        2   0.07561437
Religion - Atheist/None                 53   2.00378072
Religion - Other                       167   6.31379962
Attendance - Never                     192   7.25897921
Attendance - Special Occasions         310  11.72022684
Attendance - Less than once a month    138   5.21739130
Attendance - Once a month              324  12.24952741
Attendance - 2-3 times a month         507  19.16824197
Attendance - Once a weel               738  27.90170132
Attendance - 2-3 times a week          257   9.71644612
Attendance - 4-6 times a week          106   4.00756144
Attendance - Every day                  73   2.75992439

                                       Mean           SD
Attendence Per Month              4.318904     6.142649
Religiousness (0-10)              6.827599     2.379580
Household Size                    4.462760     1.969086
Age Responder                    42.718715    11.041298
Years of Schooling Responder      7.446388     3.686763
Household Expenditure           297.264750   151.358338
```

Figure 2: [2]. Reproduction of table 2 in the paper.

As a final comment on why this data set is relevant, because this data set has this new situation where families who were previously in a lower "class" (when it comes to wealth) have now have moved up, they have effectively lost a part of their income. This is significant because now, since we have the data on their behavior after such an event, we can examine how they act after losing the government transfer when it comes to religion. We can also perform analysis on the people who gained the transfer. More specifically, it is the people near the cutoff that we can truly make causal inferences on because, on average, we would expect these families to have no difference. Lastly, this next figure is a reproduction of the figure 3 graph[7]:

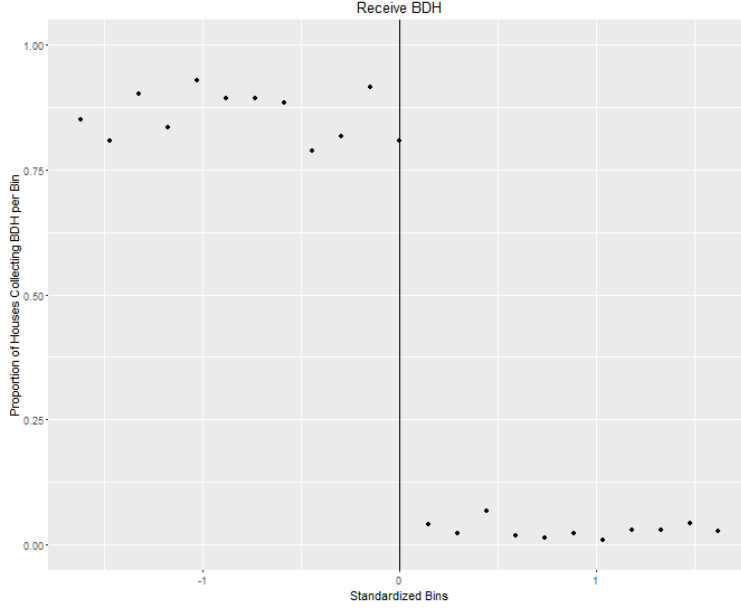[7]Page 185 in Volume 7, No. 3 of the *AMERICAN ECONOMIC JOURNAL: APPLIED ECONOMICS*

Figure 3: [3]. Reproduction of figure 3 in the paper. This figure is representative of the proportion of households who collect the transfer above and below the cutoff

III. Models & Results

If we were to run an OLS, the expected model would be:

$$Y_i = f(s) + \delta T_i + \epsilon_i$$

where:

- Y_i = The outcome variable (religiousness, protestant, attendance)

- T_i = An indicator for whether you receive the transfer

- $f(s)$ = Some function of the SELBEN score

With the assumptions being that $\text{var}(\mu|x) = \sigma^2 I_n$[8], $E(\mu|x) = 0$, and that each data point comes from a normal distribution. The results that I got from this regression are in Figure 4 below.

---

[8]homoskedasticity

```
                                  T Robust SE
Church Attendance          0.550236080 0.3648068
Being Evangelical          0.006712481 0.0224748
Self-Rated Religiousness 0.041667997 0.1343666
```

Figure 4: [4]. This is not in the paper. This is an OLS regression I did.

These results tell us that there is some positive affect on all 3 of the variables (church attendance, being evangelical, self-rated religiousness) by receiving the transfer. As shown in the .rmd file however, these results are not significant in any of the cases and in fact, this regression is not a correct way of going about things regarding this problem.

This regression does not give us useful results because of the effect that T_i has on Y_i through the error term. This is because this indicator variable represents whether you receive the transfer or not and because not everyone who is supposed to receive it actually gets it, we get endogeneity. Therefore, in order to fix such a problem, we instrument T_i by a variable Z_i: Whether you are eligible for the transfer or not. This is a relevant instrument because everyone who is to receive the transfer must be below the cutoff[9]. This instrument is exogenous because the cutoff is set in stone. That is to say, everyone who is below the cutoff is eligible for the transfer whereas everyone who is above it, is not. This results in exogeneity because there is nothing in μ that would allow someone above the cutoff to receive it other than venturing into the bottom 40th percentile.

The general model that this paper decides to go with is:

$$Y_i = \alpha + \delta T_i + f(s) + \beta X_i + \epsilon_i$$

where:

- Y_i = The outcome variable (religiousness, protestant, attendance)

- T_i = An indicator for whether you receive the transfer

- Z_i = Whether you are eligible for the transfer or not (this will be the instrument used for T_i)[10]

---

[9]The cutoff is the 40th percentile

[10]This instrument is used because not everyone who is supposed to receive the transfer, actually does. This results in endogeneity because now there is going to be some factors in the error term which are correlated with T_i

- X_i = A set of controls

- $f(s)$ = Some function of the SELBEN score

This model is based on a regressions discontinuity design. We are going to attempt to make causal inferences of people who are at the cutoff. We will also be fitting different functions of the SELBEN score[11] ($f(s)$). First, here is a reproduction of figure 4[12] in the paper:
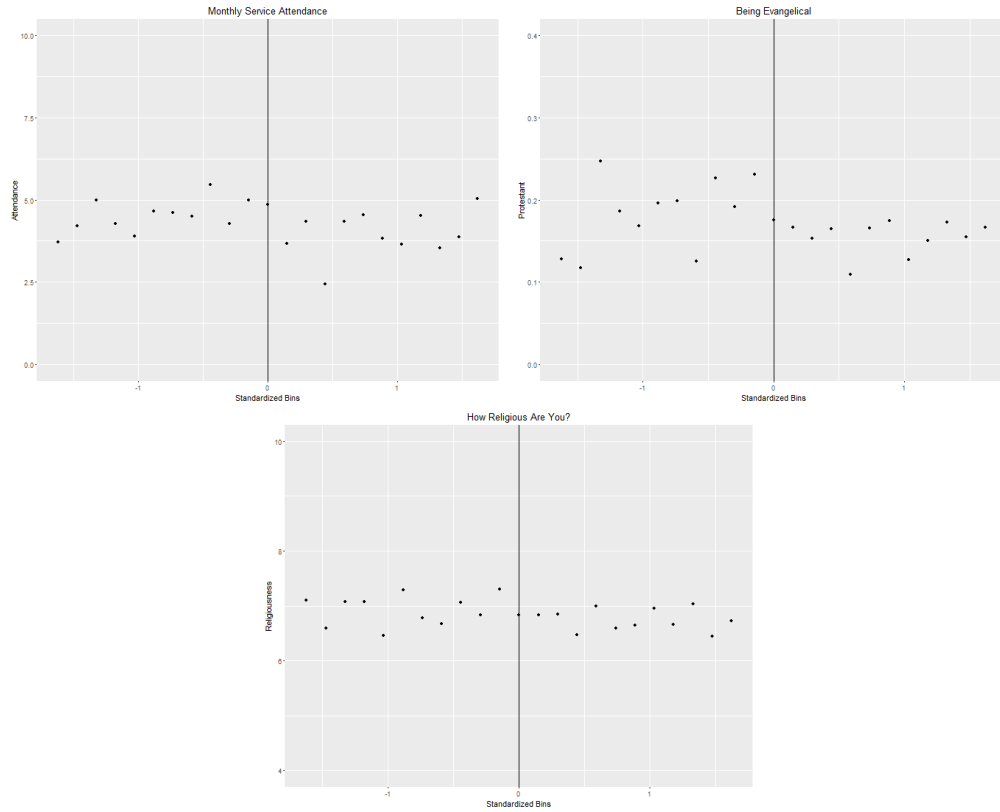

Figure 5: [5]. Reproduction of figure 4 in the paper. This figure shows the regression discontinuity graphs where the dots represent the average outcome for the households in each bin. The vertical bar is the cutoff.

---

[11]Linear, quadratic, and cubic

[12]Page 188 in Volume 7, No. 3 of the *AMERICAN ECONOMIC JOURNAL: APPLIED ECONOMICS*

After running the regression using the instrument, I got the following table (the results are probably slightly different because of rounding error):

	Linear	Quadratic	Cubic	Linear + Controls	Quadratic + Controls	Cubic + Controls
Church Attendance	1.72805073	1.72305118	1.52375095	1.86287202	1.85412238	1.62317538
Robust SE Church Attendance	0.60087503	0.59691176	0.83333697	0.59842281	0.59543253	0.83064506
Being Evangelical	0.06666617	0.06479533	0.03515586	0.07189486	0.06973809	0.03793284
Robust SE Being Evangelical	0.03665013	0.03662784	0.05193332	0.03670859	0.03669411	0.05213467
Self-rated Religiousness	0.27048744	0.25630958	0.31380350	0.27546448	0.26445877	0.34715550
Robust SE Self-rated Religiousness	0.22908602	0.23125287	0.31840219	0.22857336	0.23087614	0.31744058

Figure 6: [6]. This is a replication of table 4 in the paper. It shows the results of the regression discontinuity design regression with the instrumented variable.The controls are variables added onto the regression and they are household size, age of the responder, and the years of schooling of the responder.

The effect of the transfer on church attendance were all significant[13]. This means that, one average, the data tells us that people are more likely to attend church (since all the coefficients were positive) after receiving the transfer. The results were similar for whether someone was a protestant or not. Therefore, we would expect that, on average, if a family receives a transfer, they are more likely to be protestant. Lastly, the results tell us that the effects were not significant when it comes to self-reported religiousness. There was not any significant impact of the transfer on whether or not religiousness is any higher after the fact. From these results then, we can conclude that people tend to be more protestant as they gain income, people tend to attend church more often, and people do not seem to have a higher self-reported religiousness (on average) with a higher income.

Next, the paper splits the data into people who have a higher and lower religiousness than the mean of the sample. Then, the same regressions were carried out as above. This allowed the author to make comments on these two subsets of people. The following is the results from the regression:

	Linear	Quadratic	Cubic	Linear + Controls	Quadratic + Controls	Cubic + Controls
Church Attendance - Above Avg. Rel.	2.44826818	2.48732718	2.075545541	2.59439894	2.61811212	2.059088691
Robust SE Church Attendance	0.90794203	0.89688099	1.225038630	0.90843271	0.89851156	1.220778423
Church Attendance - Below Avg. Rel.	0.62397291	0.55243044	0.786169593	0.73737377	0.66796104	1.000618173
Robust SE Church Attendance	0.68763764	0.69077741	1.017180302	0.68916633	0.69281723	1.029317114
Being Evangelical - Above Avg. Rel.	0.14188802	0.13391222	0.055056982	0.15173559	0.14316260	0.060648482
Robust SE Church Attendance	0.05187488	0.05177718	0.073178929	0.05208989	0.05197633	0.073374804
Being Evangelical - Below Avg. Rel.	-0.02728135	-0.02278630	0.005554599	-0.02461721	-0.02000223	0.009031331
Robust SE Church Attendance	0.05081455	0.05088999	0.071932203	0.05102670	0.05114942	0.072813294

Figure 7: [7]. This is a replication of table 5 in the paper.

---

[13]Again, all the summaries can be found in the .rmd file

For both the rows containing the below average religious results, the analysis found that, on average, there is no statistically significant impact on whether receiving the transfer changed the amount of times they attended church or whether they changed religion. For the above average results, they were significant in both cases. It seems that people with above average religion are expected to go to church 3 more times. They also tend to become evangelical as they gain this income. Interesting to note that, while the effects were not significant, the results show that people who belong to the below average religious subset tend to stop being protestant as they get the transfer. Next, here are the graphs from figure 5 in the paper:
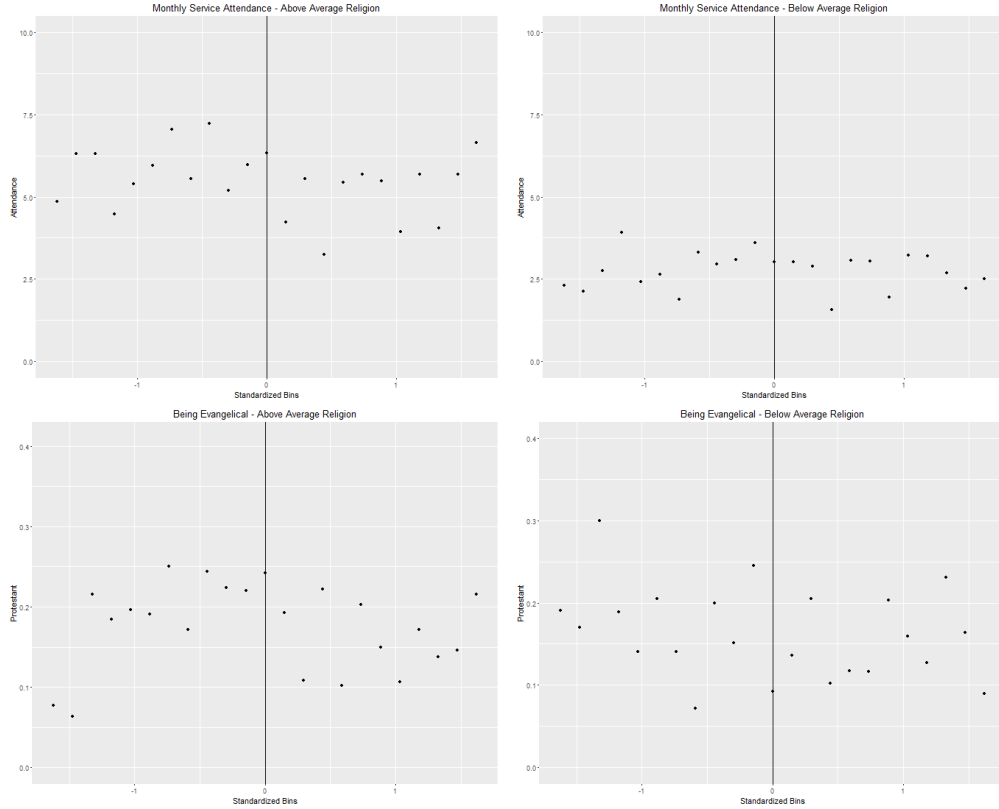

Figure 8: [8]. Reproduction of figure 5 in the paper. This figure shows the regression discontinuity graphs for two subsets of the sample (Above and Below Average Religiousness).

The reason that these results allow us to infer causal effects is two-fold. The first reason is that, because we are using a regression discontinuity design, we can make a lot of assumptions about a specific (narrow-band) subgroup

of people from which we took the sample. This subgroup is the people who are very close to the cutoff. These assumptions could be that these families are very similar in nature and, just by chance, the families close to this cutoff could have easily been on one side or the other. They are within the margin of error. Since these families are nearly indistinguishable in this respect, we can see income as being a causal effect as to why there is a discrepancy from one side of the cutoff to the other when it comes to attending church and being evangelical. Another reason is that we have effectively eliminated endogeneity from this experiment by using an instrument of the cutoff for whether someone receives the transfer or not (as explained earlier). This allows us to interpret our results without the fear of it being skewed by measurement error.

IV. Conclusions

After doing the analysis, the results tell us that there is some positive effect of income on how often you attend church and whether you are more likely to switch religion (in this case, to an evangelical). After doing further analysis, it was found that this effect is more specific to the subset of people from the sample who rated themselves about the average religiousness. The interpretation of these results is limited to the people of Ecuador who are near the 40th percentile when it comes to the SELBEN score. A reason this might be happening is because of the culture. Since people have more money (because of the transfer), they may have more of an opportunity to present themselves and gain "respect" from other families. A good way to showcase this while also simultaneously keeping a high moral standing, is to go to church.

There are quite a few problems with the results of this data. First, just by looking at the regressions discontinuity graphs, it is easy to notice that, even near the cutoff, there doesn't seem to be a need for a regression discontinuity design. For example, in figure 8, there are hardly any easily recognizable jumps at the cutoff. Even if it is the case that the government transfer does cause some sort of shift in attitudes towards religion, I think that the analysis here is not necessarily indicative of that except maybe for that very narrow band right next to the cutoff. Moving on, we also have to make note that these results are NOT generalizable. This is because they can only have any meaning when it comes to people in Ecuador who are poor. This is not a country that is at all representative of the West in terms of the social culture

or economics. I would think that in the West, it might actually be the opposite effect because of our exposure to different ideas and having access to the internet. Another problem with this paper is that the questions are presented as kind overarching and all-encompassing however, the sample used does not reflect that sentiment. If the questions were more specific i.e "How does an increase in income affect a lower-middle class families religiousness?" or how increases in income affect certain parts of the world in terms of religiousness, then this analysis might be more sufficient.

An alternative way of trying to answer this question might be to consider a different question: Are income and religiousness even related? Clearly, there is an answer to this question and this answer might change depending on the context withing which you are trying to answer it. Within the country of Ecuador, it seems that there was a significant relationship, but is that because of some personal sense of gratitude or because of some other reason? The reasoning I provided earlier is rooted in pride (i.e people want respect), but then the primary reason is not religiousness. Therefore, there is a risk of coming to false conclusions about this relationship even within the narrow band that this analysis applies to. Also, there might be some error with how they collected some of their data. I feel like the variable "self-rated religiousness" is bound to be inaccurate unless some measures are taken. I think it would be useful to provide the procedure used to come to those numbers.

V. References

- Buser, Thomas The Effect of Income on Religiousness American Economic Journal: Applied Economics 7 3 178-95 2015 10.1257/app.20140162 http://www.aeaweb.org/articles?id=10.1257/app.20140162

- "Regression Discontinuity Design." PsycEXTRA Dataset (n.d.): n. pag. Web.

- www.youtube.com/channel/watch?v=tWRsYWSP3fM "An Intuitive Introduction to Regression Discontinuity." YouTube. YouTube, 30 Jan. 2015. Web. 25 Nov. 2016.