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The Effect of Economic Growth on a  
Society's Informal Institutions: A  
Mixed Level Model Analysis

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# The Effect of Economic Growth on a Society's Informal Institutions: A Mixed Level Model Analysis

## ABSTRACT

*This paper tests the Grand Transition (GT) view that economic growth drives institutional change. The paper identifies three representative informal institutions: post-materialist values, religiosity, and attitudes towards the family. Three Mixed Level Models are estimated to analyse how each informal institutions is shaped by economic growth. The results show that as a nation becomes more economically developed, citizens experience higher levels of post-materialist values, a decline in their religiosity and place less importance on the family.*

## KEYWORDS

*Informal institutions, economic growth, Grand Transition view, nuclear family, post-materialist values, religiosity, and mixed level models.*

## 1 INTRODUCTION

Although roles of economic growth and institution building are recognised to be complementary for a society's overall development, there has been a recent literature (notably, Paldam and Gundlach, 2008) on testing two views: the Grand Transition (GT) and the Primacy of Institutions (PI). According to the former view,

long run economic growth *endogenously* leads to new institutions <sup>1</sup> and transformation of old ones. The latter view, on the other hand, emphasises that *exogenously* designed appropriate institutions at different levels of a society help generate its economic growth.

This paper is motivated by a desire to use the World Values Survey (2014a) to test the Grand Transition view. The GT view is best summarised by the phrase ‘development causes everything, including institutional change’ (Paldam and Gundlach 2008, p68). The underlying logic of the view is that once economic growth starts in a nation, its institutions will inevitably change. This view was first articulated by Marx, who argued that the economy, or in his words, the ‘factors of production,’ determine the institutions or ‘superstructure’ of each society. Inglehart and Welzel (2005, p1) argue that while Marx and others who initially espoused this view were “wrong on many points, their central insight – that socioeconomic development brings major social, cultural and political changes– is basically correct.” Furthermore, institutional change is not linear, but values are nevertheless “changing in a predictable direction as socioeconomic development takes place” (Inglehart and Welzel, 2005 p1). It is important to recognise Inglehart and Welzel’s argument that while economic factors are significant in explaining institutional change, they are not the only causes of change. This paper focuses on informal institutions, which are defined as “the collection of social norms,

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<sup>1</sup> Institutions, as defined by North (1994, p. 360) are “the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. They are made up of formal constraints (e.g. rules, laws, constitutions), informal constraints (e.g. norms of behaviour, conventions, self-imposed codes of conduct), and their enforcement characteristics.”

conventions, and moral values that constrain individuals and organizations in pursuit of their goals” (Raiser 2001, p. 218).

Data is collected from the World Values Survey (2014a) to test the GT view that economic growth shapes individual’s values, attitudes, and beliefs. The sample data covers three groups of countries with advanced, emerging market and developing economies. The three hypotheses tested in this paper are that higher level of economic growth leads to citizens having a (i) higher level of post materialist values, (ii) lower level of religiosity, and (iii) lower attitude towards the nuclear family. These hypotheses are supported by the multivariate analyses. This suggests that economic growth influences informal institutions.

The present paper proceeds as follows: Section 2 identifies three informal institutions that the literature proposes are determined by economic outcomes. Section 3 develops the research methodology used by this paper to test Grand Transition view using these three informal institutions. Section 4 presents the mixed level models. Section 5 outlines the robustness testing of the results. Section 6 concludes this paper, after highlighting the limitations of the analysis, and suggesting ideas for future research.

## **2 LITERATURE REVIEW**

This section identifies three informal institutions that GT proponents claim are driven by economic factors. The three informal institutions identified are: (i) post-materialist values; (ii) religiosity; and (iii) attitudes towards the nuclear family.

Using the World Values Survey, Inglehart (1971) found that societal values in advanced industrialised societies were changing due to the unprecedented economic progress. Echoing Maslow's (1943) Hierarchy of Needs<sup>2</sup>, Inglehart (1977) argued that Europe was undergoing a rise in what he called 'post-materialist values' as a result of lower order sustenance (or material) needs being satisfied. Europeans are therefore placing a greater emphasis on non-material or post-material needs such as a sense of community, care for the environment, and tolerance of alternative sexualities (Inglehart and Appel 1989). These *post-materialistic values* develop in the youth of each nation, and become dominant as the younger generation replaces the older one. His findings were supported with his co-author Paul Abramson in later studies (Abramson and Inglehart 1986; Abramson and Inglehart 1987; Inglehart and Abramson 1994). Marini (2004) agrees, and uses Inglehart's post-materialist values as the foundation of his Post-Materialist Syndrome.

Inglehart proposes that *post-materialist* values develop during the formative years of an individual. In advanced economies, the younger generations do not face the material struggle for survival, and in a similar vein to Maslow's (1943) hierarchy of needs, begin to desire higher order or non-material needs. Following in the footsteps of Maslow (1943), this paper proposes that the shift towards post-materialist values also occurs in adults. The logic is that as the lower order physiological and safety needs of food, water, and shelter become satisfied by

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<sup>2</sup> Maslow's hierarchy of needs is a theory in psychology describing the pattern of human motivations. Maslow (1943) proposed that once lower order, or "physiological" and 'safety' needs have been satisfied, a person will seek to satisfy higher order needs such as 'belongingness', 'love' and esteem.'

economic development, members of a society will seek to satisfy the higher level needs of esteem and, ultimately, self-actualisation.

The second informal institution is *religiosity*. The two studies of Barro and McCleary (2003) and McCleary and Barro (2006a) examine the relationship between economic and religious variables, and find results that appear to contradict themselves. In their earlier study, Barro and McCleary (2003, p760) find that religious belief leads to higher levels of economic growth due to its influence on “individual traits that enhance economic performance,” while religious practice leads to lower levels of economic growth. However, in their later study, McCleary and Barro (2006a) find that higher levels of economic growth lead to lower levels of ‘religiosity,’ which is a combination of religious beliefs and practices, and therefore a broader measure of religion than those used in their first study, such as ‘church attendance’ or ‘belief in heaven’.

The present paper builds on the conclusions of their second study (McCleary and Barro 2006a), in which they find that higher levels of economic growth lead to lower levels of ‘religiosity.’

McCleary and Barro’s (2006a) finding was earlier supported in Norris and Inglehart (2004), using data collected from the World Values Survey. Norris and Inglehart argued that higher levels of economic development led to lower levels of religious beliefs. Higher levels of economic development create a safety-net for people, which in turn reduces their dependence on religious figures and beliefs for material survival. Norris and Inglehart (2004, p24-25) thus observed that “due to

rising levels of human security, the publics of virtually all advanced industrial societies have been moving towards more secular orientations.”

The third informal institution of *attitudes towards the nuclear family* has been addressed by Tilley (2012) in his analysis of Marx and Engel's (2002) *Communist Manifesto*. Tilley claims that higher levels of economic development will lead to a decline in societal attitudes towards the Judeo-Christian concept of the family. Tilley cites Marx and Engel's arguments that economic development within a capitalist system throws the family into the labour market, thereby tearing away any sentimental veil attached to the family unit. Stern (1948) agreed, citing Engel's (1958) observations on the English working class in his time, to argue that, as parents become more involved in the labour market, they place a lower importance on the Judeo-Christian (or nuclear) family. Stern (1948) stressed, however, that Engel saw this as a good thing, as it will ultimately lead to a higher form of the family.

While these arguments were set out within the context of a Marxist analysis of Capitalist society, they may also be applicable to a much broader understanding of economic growth and development. This application of Marxist theory is consistent with the perspective of Inglehart and Welzel (2005, p1), who identify Marx as a key figure in arguing that “socioeconomic development brings major social, cultural and political changes.” Inglehart and Appel (1989) had already indirectly examined the relationship between economic factors and the family, and found that post-materialist societies have a much higher tolerance towards divorce. Their earlier findings thus suggest that personal freedoms are more important than family life in economically developed societies.

The remainder of this paper will quantitatively test whether *post-materialist values, religiosity, and attitudes towards the Judeo-Christian family* are driven by economic factors.

### **3 HYPOTHESIS DEVELOPMENT AND MODEL SPECIFICATION**

This section has four objectives: it (i) proposes the hypotheses to be tested; (ii) creates the variables; (iii) outlines the model specification; and (iv) describes the sample selection process.

#### ***(i) Hypothesis development***

Section 2 identified three informal institutions hypothesised to be influenced by economic factors. The theoretical relationship between each of these informal institutions and economic growth, as discussed in Section 2, leads to the following hypotheses:

H1 – Higher levels of economic growth in a nation lead to citizens having higher levels of post materialist values (such as a sense of community, care for the environment, and tolerance of alternative sexualities), *ceteris paribus*.

H2 – Higher levels of economic growth in a nation leads to citizens having a lower level of religiosity (a combination of religious beliefs and practices), *ceteris paribus*.



H3 – Higher levels of economic growth in a nation leads to citizens having a lower attitude towards the nuclear family, *ceteris paribus*.

**(ii) *Creation of variables***

This paper uses data collected by The World Values Survey to test each of the three hypotheses. The World Values Survey is “the largest non-commercial, cross-national, time series investigation of human beliefs and values ever executed” (World Values Survey 2014b). It consists of “nationally representative surveys conducted in almost 100 countries which contain almost 90 percent of the world’s population” collected over six waves, beginning in 1981 (World Values Survey 2014b). The World Values Survey evolved from the 1981 European Values Survey (EVS), which was created to “test the hypothesis that economic and technological changes are transforming the basic values and motivations of the publics of industrialized societies” (World Values Survey 2014b). The survey therefore collects values on a wide range of informal institutions such as “support for democracy, tolerance to foreigners and ethnic minorities, support for gender equality, the role of religion and changing levels of religiosity, the impact of globalization, [and] attitudes toward the environment, work, family, politics, national identity, culture, diversity, insecurity, subjective wellbeing” (World Values Survey 2014c). The exact wording of each question is available on the World Values Survey Association’s website, along with the countries and years in which each question was asked<sup>3</sup>.

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<sup>3</sup> [www.worldvaluessurvey.org](http://www.worldvaluessurvey.org)

The World Values Survey (2014a) contains two measures of post-materialist values: a 4-item index, and a 12-item index. Tranter and Western (2010) observe that the 4-item index has been used extensively by researchers, and has endured several criticisms and defences. This paper uses the 12-item index, which includes the entire 4-item index.

The World Values Survey does not directly measure religiosity or attitudes towards the nuclear family. It does, however, ask numerous questions which are related to these factors. The answers to these questions are observed variables in the dataset, and are used in a principal component factor analysis to deduce the unobserved factors that this paper is examining.

Four variables are developed using questionnaire items from the World Values Survey. Every question asked in each wave was analysed, and any questions that gave an indication on attitudes towards religion or the family were highlighted. If one of these questions appeared in more than three of the six waves, it was included on a short list. From this short list, a series of questions was chosen for each variable, so that the underlying questions captured multiple facets of the values, attitudes and beliefs this paper seeks to measure.

Survey responses for each of the chosen questions are included in a factor analysis. The factor analysis is undertaken on the full sample of the World Values Survey to ensure that the factors are as comparable as possible. IRELIGION and IFAMILY are calculated using individual survey responses to measure *individual* religiosity and attitudes towards the family. CRELIGION and CFAMILY are

calculated using national averages for each of the survey answers to measure *national* religiosity and attitudes towards the family. The national measures thereby adopt the procedure followed by Hofstede (1980, 2001) and House et al. (2004). These national averages take into account the weightings attributed to individual observations within the World Values Survey. The weightings are not used to calculate the individual factors, as they are conditional on national selection. These weightings will, however, be analysed in the robustness testing in Section 5.

### *IRELIGION and CRELIGION*

H2 predicts that economic growth will lead to a decline in religiosity within nations. The variables IRELIGION and CRELIGION are created to measure individual and national religiosity within each country. The items used from the World Values Survey to construct IRELIGION and CRELIGION are listed below<sup>4</sup>:

- A040 – “Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Please Choose up to five.” – Respondents who answered “Religious Faith.”
- E069 – “I am going to name a number of organisations. For each one, could you tell me how much confidence you have in them: Is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? The Churches” – Respondents who answered: “A great deal,” or “Quite a lot.”

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<sup>4</sup> All questions taken from the European Values Study Group and World Values Survey Association (2006).

- F028 – “Apart from weddings, funerals and christenings, about how often do you attend religious services these days?” – Respondents who answered: “More than once a week,” or “Once a Week”
- F034 – “Independently of whether you go to church or not, would you say you are” – Respondents who answered: “A religious person”
- F050 – “Which, if any, of the following do you believe in?” – Respondents who answered: “God.”
- F051 – “Which, if any, of the following do you believe in?” – Respondents who answered: “Life after death.”
- F053 – “Which, if any, of the following do you believe in?” – Respondents who answered: “Hell.”
- F054 – “Which, if any, of the following do you believe in?” – Respondents who answered “Heaven.”

A040 captures the importance of religion in family life, by measuring the extent to which parents want to pass on religious beliefs to their children. E069 captures social attitudes towards the institutionalised form of each individuals religion. Note that the question here was taken from the English language version of the World Values Survey, and hence, has a Christian bias. F028 measures each respondent’s devotion by determining whether they put their faith into action, and F034 determines how respondents identify themselves. Finally F050, F051 F053 and F054 measure beliefs in traditional religious teachings across each nation. These questionnaire items are similar to those used by McCleary and Barro (2006a, 2006b) to construct their religiosity measure.

The factor analysis identifies one factor underlying each of these variables at both the individual and national level. IRELIGION has an Eigenvalue of 3.7840, and explains 47.3% of the total variance of the variables at the individual level, while CRELIGION has an Eigenvalue of 6.6797, and explains 83.5% of the total variance of the three variables at the national level. Table 1 presents the factor coefficients and uniqueness of each of these World Values Survey (WVS) eight variables used to create the institutional factors of IRELIGION and CRELIGION.

**Table 1: IRELIGION and CRELIGION**

	Individual		National	
	IRELIGION	Uniqueness	CRELIGION	Uniqueness
A040	0.5806	0.6629	0.9107	0.1706
E069	0.6074	0.6311	0.9321	0.1311
F028	0.5386	0.7099	0.8317	0.3083
F034	0.6673	0.5546	0.8955	0.1980
F050	0.7191	0.4829	0.8767	0.2314
F051	0.7229	0.4775	0.9476	0.1021
F053	0.7717	0.4045	0.9375	0.1211
F054	0.8411	0.2925	0.9707	0.0577

*Note:* Table 1 presents the factor loadings and uniqueness of each of the WVS variables used to create IRELIGION and CRELIGION.

Table 1 shows that all of the factor loadings are positive for both IRELIGION and CRELIGION. The factor loadings are much higher for CRELIGION than they are for IRELIGION due to the greater variability in the individual level data. This variability also explains why the variables used to calculate IRELIGION have a much higher uniqueness than those used to calculate CRELIGION.

*IFAMILY and CFAMILY*

H3 predicts that economic growth will lead to a decline in attitudes towards the Judeo-Christian concept of the family in each nation. The variables IFAMILY and CFAMILY are developed to measure individual and national attitudes towards this understanding of the family. The three items used from the World Values Survey to construct IFAMILY and CFAMILY are listed below<sup>5</sup>:

- A025 – “With which of these two statements do you tend to agree?” – Respondents who answered: “Regardless of what the qualities and faults of one’s parents are, one must always love and respect them.”
- A026 – “Which of the following statements best describes your views about parents’ responsibilities to their children?” – Respondents who answered: “Parent’s duty is to do their best for their children even at the expense of their own well-being.”
- D018 – “If someone says a child needs a home with both a father and a mother to grow up happily, would you tend to agree or disagree?” – Respondents who answered: “Tend to agree.”

A025 and A026 measure attitudes towards the relationships between parents and children, while D018 captures the belief in the importance of the nuclear family. Higher values of IFAMILY and CFAMILY are expected to be associated with a high commitment to one’s parents and children, and a strong belief in the nuclear family.

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<sup>5</sup> All questions taken from the European Values Study Group and World Values Survey Association (2006).

The factor analysis identifies one factor underlying A025, A026 and D018 at both the individual and national level. IFAMILY has an Eigenvalue of 1.2616, and explains 42.1% of the total variance of the three variables at the individual level, while CFAMILY has an Eigenvalue of 2.8995, and explains 96.7% of the total variance of the three variables at the national level. Table 2 presents the factor coefficients and uniqueness of each of the three WVS variables used to create the institutional factors of IFAMILY and CFAMILY.

**Table 2: IFAMILY and CFAMILY**

	Individual		National	
	IFAMILY	Uniqueness	CFAMILY	Uniqueness
A025	0.7351	0.4596	0.9924	0.0151
A026	0.6529	0.5738	0.9754	0.0486
D018	0.5431	0.7050	0.9814	0.0368

*Note:* Table 2 presents the factor loadings and uniqueness of A025, A026 and D018 to create IFAMILY and CFAMILY.

Table 2 shows that all of the factor loadings are positive for both IFAMILY and CFAMILY. As was the case in Table 1, the factor loadings for IFAMILY are lower than for CFAMILY due to the greater variability in the individual level data.

### **(iii) Model Specification**

This paper tests the hypotheses developed above with mixed linear models. Mixed linear models, also known as hierarchical regression models, allow researchers to test observations nested in groups, or hierarchies. Following the testing procedure outlined by Fielding (2010) and Leckie (2013), this paper first identifies the nesting structure of the data, before adding fixed effects, and then random effects to the model.

Individuals are nested in regions (WVS variable X048<sup>6</sup>), which are, in turn nested in nations (WVS variable S003). Time (WVS variable S002) enters the model as a random effect at both the regional and national level, indicating that time has a different effect on individual values, depending upon the region and nation in which someone lives. This is true when modelling each of IPOSTMAT, IRELIGION, and IFAMILY.

Note that the basic model below is used to test each of the three hypotheses (H1, H2 and H3) separately by replacing informal institutions (INFINS) with post-material values (POSTMAT), religiosity (RELIGION) and attitudes towards the family (FAMILY) respectively.

The basic model is:

$$\begin{aligned}
 IINFINS_{irc,t} = & \beta_0 + \beta_1 CINFINS_{c,t-1} + \beta_2 GDPPC_{c,t-1} + \beta_3 FEMALE_{irc,t} \\
 & + \beta_4 AGE_{irc,t} + \beta_5 AGE_{irc,t}^2 + \beta_6 EDUC_{irc,t} + \beta_7 EDUC_{irc,t}^2 \\
 & + \beta_8 CHILDREN_{irc,t} + \beta_9 SEMP_{irc,t} + \beta_{10} EMP_{irc,t} + \beta_{11} STUD_{irc,t} \\
 & + \beta_{12} INCOME_{irc,t} + \beta_{13} WAVE_{rc,t} + u_{0rc} + u_{1rc} WAVE_{rc,t} + v_{0c} \\
 & + v_{1c} WAVE_{rc,t} + \epsilon_{irc}
 \end{aligned}$$

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<sup>6</sup> The question for X048 in the World Values Survey gives the “region where the interview was conducted” (European Values Study Group and World Values Survey Association 2006, p795). This paper assumes that this region is the same as that where the respondent lives, or provides a reasonable estimate of it.



$IINFINS_{irc,t}$  is individual  $i$ 's score for the informal institution being tested. For H1 this is  $IPOSTMAT_{irc,t}$  and is the individual's post-materialist value, calculated using variable Y001 from the World Values Survey. H2 and H3 test individual religiosity (  $IRELIGION_{irc,t}$  ) and attitudes towards the Judeo-Christian understanding of the family ( $IFAMILY_{irc,t}$ ) respectively. These two variables were developed in Section 3(ii).

$CINFINS_{c,t-1}$  is country  $c$ 's score of the informal institution being tested. For H1 this is  $CPOSTMAT_{c,t-1}$ , and is the average score of the individual's post materialist value in each country calculated using variable Y001 from the World Values Survey. When testing H2 and H3, this is the national religiosity ( $CRELIGION_{c,t-1}$ ) and attitude towards Judeo-Christian family ( $CFAMILY_{c,t-1}$ ) respectively. These two variables were developed in Section 3(ii). The model uses the one period lag of these variables, thereby avoiding Manski's (2000) reflection problem.

$GDPPC_{c,t-1}$  is the real GDP per capita in nation  $c$  at time  $t-1$  taken from the Penn World Tables version 7.1, divided by 10 000 so that the variance of  $GDPPC_{c,t-1}$  is equivalent to the variance of the other variables being examined. A one-period lag is used, as if the hypotheses being tested is true then current individual values, attitudes and beliefs will be driven by prior levels of GDPPC.

$WAVE_{rc,t}$  is an index variable to control for the passing of time in the model, and is equal to the prevailing wave number of the World Values Survey at time  $t$ . Note that WAVE is included as both a fixed effect and random effect in the model.

The remaining variables in the model are individual level controls that may influence the values, attitudes and beliefs of individuals. Each of these was taken directly from the World Values Survey.

$FEMALE_{irc,t}$  is an indicator variable, which equals 1 if the individual is female, and 0 if male, calculated using variable X001 in the World Values Survey.

$AGE_{irc,t}$  measures the age of the respondent in years, calculated using variable X003.

$EDUC_{irc,t}$  measures the age at which the individual completed their education, calculated using variable X023. Squared terms of both  $AGE_{irc,t}$  and  $EDUCATION_{irc,t}$  are included to account for the extreme upper values of both variables.

$CHILDREN_{irc,t}$  is an indicator variable which equals 1 if the individual has children, and 0 otherwise; calculated using variable X011.

$SEMP_{irc,t}$  is an indicator variable, which equals 1 if the individual is self-employed, calculated using variable X028.

$EMP_{irc,t}$  is an indicator variable, which equals 1 if the individual is employed by another person, either full-time or part-time, calculated using variable X028.

$STUD_{irc,t}$  is an indicator variable, which equals 1 if the individual is a student, calculated using variable X028.

$INCOME_{irc,t}$  is an index variable, where the individual estimates which 10% income band they belong to within their country, with 1 being the lowest 10%, and 10 being the top 10%. This is calculated using variable X047.

#### (iv) *Sample selection*

The sample selection process is summarised in Table 3.

**Table 3: Sample Selection**

Sample Selection Process	POSTMAT		RELIGION		FAMILY	
Total Observations in the World Values Survey	343,309		343,309		343,309	
Less observations:						
from waves in which IINFINS <sub>irc,t</sub> cannot be calculated	-13,586	4%	-169,045	49%	-169,045	49%
for which the region was not provided	-32,086	9%	-34,625	10%	-34,625	10%
for which IINFINS <sub>irc,t</sub> can't be calculated	-14,574	4%	-44,568	13%	-15,716	5%
for which CINFINS <sub>c,t-1</sub> can't be calculated	-147,018	43%	-64,480	19%	-76,744	22%
for which GDPPC <sub>c,t-1</sub> can't be calculated	-2,092	1%	-1,183	0%	0	0%
for which one of the individual controls can't be calculated	-42,040	12%	-9,770	3%	-17,552	5%
<b>TOTAL</b>	<b>91,913</b>	<b>27%</b>	<b>19,638</b>	<b>6%</b>	<b>29,621</b>	<b>9%</b>

Note: This table outlines the sample selection process. The percentage shows each number as a percentage of the total number of observations in the World Values Survey.

The World Values Survey is a strongly unbalanced dataset (only 10 countries were sampled in the first wave, while 59 countries were sampled in the sixth), and has experienced significant changes to the questions asked across waves. This creates two major challenges for this paper. The first is finding questionnaire items that

are consistent across each of the six waves. This challenge is increased by the major change in the survey between the fourth and fifth waves. The second is finding nations that were surveyed in two consecutive waves so that  $CINFINS_{c,t-1}$  can be calculated. In response to these challenges, this paper estimates each model using a different sample to maximise the number observations used to test each hypothesis.

The sample selection process begins by excluding all observations from waves in which  $IINFINS_{irc,t}$  cannot be measured. For  $IPOSTMAT_{irc,t}$  only the first wave is excluded, while for  $IRELIGION_{irc,t}$  and  $INATION_{irc,t}$  the fifth and sixth waves are removed. The sample is further refined by excluding all observations in which the region is not provided (as the region is used as a nesting group), and for which  $IINFINS_{irc,t}$  cannot be calculated (as all of the questions are not asked in every survey). All observations for which  $CINFINS_{c,t-1}$  cannot be calculated are also removed. At this point, over half the sample has been removed for each of the three informal institutions tested.

Observations for which  $GDPPC_{c,t-1}$  cannot be calculated are also removed. All of these observations are taken from Eastern Europe immediately after the collapse of the Soviet Union. Finally, observations for which one or more of the individual control variables cannot be calculated are excluded from the sample. This leaves 27% of the initial sample (91 913 observations) remaining to test  $IPOSTMAT_{irc,t}$ , but only 6% and 9% (19 638 and 29 621 observations) to test  $IRELIGION_{irc,t}$  and  $IFAMILY_{irc,t}$  respectively. Table 4 breaks down the sample into nation and year groups.

**Table 4: Final Sample**

Country		1994-1998	1999-2004	2005-2009	2010-2014
Albania	P		820		
	R		553		
	F		855		
Argentina	P	795			
	R	701			
	F	781			
Bangladesh	P		1,139		
	R		1,054		
	F		1,175		
Brazil	P				1,289
Canada	P			1,726	
Chile	P	895	1,070	877	869
	R	847	950		
	F	887	1,090		
China	P	1,210	711	911	1,593
	F	1,261	731		
Cyprus	P				968
Egypt	P			2,072	991
Germany	P				1,877
Ghana	P				1,552
India	P	1,000	1,103	832	847
	R	870	1,081		
	F	1,063	1,269		
Indonesia	P			1,533	
Iran	P			2,123	
Japan	P			764	1,432
Jordan	P				1,118
Macedonia	P		942		
	R		859		
	F		990		
Malaysia	P				1,206
Mexico	P	1,294	875	1,226	1,710
	R	1,156	784		
	F	1,222	891		
Moldova	P		813	958	
	R		608		
	F		883		
Montenegro	P		767		
	R		418		
	F		772		
Morocco	P			354	400
Netherlands	P				1,506
New Zealand	P				466
Nigeria	P	1,358	443		
	R	1,295	439		
	F	1,351	399		
Peru	P		1,345	1,209	1,053
	R		1,214		
	F		1,377		
Philippines	P		1,164		
	R		1,057		
	F		1,167		
Poland	P				870
Puerto Rico	P		518		
	R		464		
	F		515		
Romania	P				1,281
Russia	P				2,049
Rwanda	P				1,315
Serbia	P		948		
	R		612		
	F		956		
Slovenia	P				869
South Africa	P	2,026	2,245	2,453	2,470
	R		1,982		
	F	2,019	2,239		
South Korea	P			1,146	1,077
Spain	P	701	772	957	962
	R	547	567		
	F	717	787		
Sweden	P		861	891	1,096
	R		638		
	F		819		
Switzerland	P	768			
Taiwan	P				1,061
Thailand	P				944
Trinidad and Tobago	P				932
Turkey	P	1,371		1,163	1,437
	F	1,423			
Ukraine	P				1,500
United States	P		1,033		2,024
	R		942		
	F		1,040		
Uruguay	P				776
Venezuela	P		951		
	F		948		
Vietnam	P			1,240	

Note: This table presents the nations included in each of the samples, and the year for which the observations were taken. P, R and F give the observations for the Post-Material, Religiosity, and Family samples respectively.

Table 4 shows that the sample for each model includes observations from most of the cultural areas identified by the World Values Survey (2015).

## **4 ANALYSIS AND RESULTS**

This analysis and results section achieves two objectives: it (i) undertakes a univariate analysis to examine the relationship between the individual level informal institutions and economic growth; and then (ii) uses the mixed level models developed by this paper to test each of the three hypotheses.

### **(i) *Univariate analysis***

The univariate analysis breaks the sample into three groups according to each nation's level of economic growth, as determined by the International Monetary Fund (2013). The groups are defined as follows:

“Advanced economies [AEs] comprise the member economies of the Organization for Economic Cooperation and Development [OECD] before 1990, with the exception of Turkey. The other economies are classified as EMDEs [Emerging Markets and Developing Economies]. At any given time, LICs<sup>7</sup> (Low Income Countries) are defined as economies in which output per capita, averaged over the previous five years, is lower than the corresponding low-income threshold, which is time varying” (International Monetary Fund 2013, p122).

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<sup>7</sup>Following the IMF classifications, all LICs are also EMDEs. For details on how to calculate the low-income threshold refer to Appendix 4.1 of the cited IMF publication.

Table 5 presents the means and standard deviations of each individual level informal institution for both the entire sample and each of the three groups: AEs, EMDEs and LICs.

**Table 5: Breakdown of Sample**

Variable Name	Mean	StDev	N	AEs			EMDEs			LICs		
				Mean	StDev	N	Mean	StDev	N	Mean	StDev	N
IPOSTMAT <sub>irc,t</sub>	1.977	1.182	91913	2.397	1.221	18804	1.869	1.147	73109	1.666	1.092	16152
IRELIGION <sub>irc,t</sub>	0.104	0.906	19638	-0.338	1.113	2694	0.174	0.847	16944	0.488	0.690	5006
IFAMILY <sub>irc,t</sub>	0.043	0.996	29627	-0.391	1.245	3363	0.099	0.946	26264	0.260	0.780	5830

Note: Table 5 presents the mean, standard deviation and total number of observations for each of the dependent variables tested by this paper. IPOSTMAT is the 12-item individual post-materialist value as calculated in the World Values Survey. IRELIGION and IFAMILY are religiosity and attitudes towards the family, as created in Section 3(ii).

Table 6 presents the results of the univariate analysis. The table presents the difference in mean for each informal institution across the three groups, along with Welch's (1947) t-statistic and Satterthwaite's (1946) degrees of freedom.

**Table 6: Univariate Analysis**

Univariate Test	AEs-EMDEs			AEs-LICs			EMDEs-LICs		
	Diff	T-Stat	DF	Diff	T-Stat	DF	Diff	T-Stat	DF
IPOSTMAT <sub>irc,t</sub>	0.528	53.555***	27942	0.730	59.041***	34896	0.730	76.224***	24656
IRELIGION <sub>irc,t</sub>	-0.512	-22.842***	3208	-0.826	-35.060***	3833	-0.826	-70.443***	9887
IFAMILY <sub>irc,t</sub>	-0.490	-22.044***	3874	-0.651	-27.386***	4912	-0.651	-55.335***	10015

Note: Table 6 presents the univariate analysis of the differences in average IPOSTMAT, IRELIGION and IFAMILY between Advanced Economies (AEs), Emerging Markets and Developing Economies (EMDEs) and Low Income Countries (LICs). \*, \*\* and \*\*\* are used to indicate significance at the less than 10%, 5% and 1% levels respectively for the two-tailed test. IPOSTMAT is the 12-item individual post-materialist value as calculated in the World Values Survey. IRELIGION and IFAMILY are religiosity and attitudes towards the family, as created in Section 3(ii).

Table 6 finds preliminary support for each of the three hypotheses. H1 is supported, as the mean of IPOSTMAT<sub>irc,t</sub> is significantly higher in AEs than in EMDEs and LICs at the less than 1% level. Likewise, H2 and H3 are supported as

the means of  $IRELIGION_{irc,t}$  and  $IFAMILY_{irc,t}$  are significantly lower in AEs than in EMDEs and LICs at the less than 1% level.

**(ii) Mixed level models**

Table 7 presents the results of the mixed level models developed in Section 3(iii).

**Table 7: Mixed Level Models**

		Model 1	Model 2	Model 3
		$IPOSTMAT_{irc,t}$	$IRELIGION_{irc,t}$	$IFAMILY_{irc,t}$
Fixed Effects	Constant	1.7275 (7.73)***	0.3734 (1.00)	0.3683 (-1.26)
	$GDPPC_{c,t-1}$	0.2640 (6.72)***	-0.1693 (-2.49)**	-0.3366 (-4.42)***
	$CINFINS_{c,t-1}$	-0.0145 (-0.48)	0.3298 (8.30)***	0.0022 (0.07)
	$FEMALE_{irc,t}$	0.0200 (2.65)***	0.2124 (19.16)***	-0.0636 (-5.54)***
	$AGE_{irc,t}$	0.0036 (2.46)**	0.0049 (2.27)**	-0.0016 (-0.70)
	$AGE_{irc,t}^2$	-0.0001 (-5.21)***	-0.0000 (-0.95)	0.0001 (2.32)**
	$EDUC_{irc,t}$	0.0306 (24.72)***	-0.0225 (-8.38)***	-0.0171 (-6.10)***
	$EDUC_{irc,t}^2$	-0.0003 (-19.27)***	0.0003 (6.18)***	0.0002 (3.39)***
	$CHILDREN_{irc,t}$	-0.0791 (-7.85)***	0.0375 (2.52)**	0.1347 (8.51)***
	$SEMP_{irc,t}$	0.0279 (2.07)**	-0.0209 (-1.11)	-0.0558 (-2.84)***
	$EMP_{irc,t}$	0.0381 (4.05)***	-0.0490 (-3.62)***	-0.0391 (-2.77)***
	$STUD_{irc,t}$	0.1107 (6.65)***	0.0053 (0.24)	0.0000 (0.00)
	$INCOME_{irc,t}$	0.0074 (4.23)***	-0.0052 (-2.11)**	-0.0003 (-0.13)
	$WAVE_t$	-0.1062 (-2.45)**	-0.0702 (-0.54)	0.2181 (2.93)***
Ra	COUNTRY			



	Constant	-0.1926	1.9891	0.4848
	WAVE <sub>t</sub>	0.0401	0.2589	0.0306
	Covariance	0.9981	-0.7176	-0.1146
	REGION			
	Constant	0.8905	0.3355	0.9202
	WAVE <sub>t</sub>	0.0326	0.0258	0.0663
	Covariance	-0.1669	-0.0885	-0.2423
Other	Observations	91913	19638	29627
	Wald $\chi^2$	1934.43	916.11	501.46
	Prob > $\chi^2$	0.000	0.000	0.000
	Log likelihood	-138387.84	-21718.51	-39983.516
	Akaike Criterion	276817.7	43479.03	80009.03

*Notes:* This table presents the results of the mixed linear models testing the hypotheses developed in this paper. The dependent variables in each of the models are IPOSTMAT<sub>irc,t</sub>, IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> which measure individual values, attitudes, and beliefs, towards post-materialist values, religion, and the family respectively. IPOSTMAT<sub>irc,t</sub> was taken from the World Values Survey. IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> were developed in Section 3(ii). The table presents the coefficient for each of the fixed effects along with the t-ratio. \*, \*\* and \*\*\* are used to indicate significance at the less than 10%, 5% and 1% levels respectively for the one-tailed test. For each of the random effects the coefficient is reported for the constant (cluster intercept term), the WAVE<sub>t</sub> (random effect) and the covariance between the constant and the wave. The variables used in each of the models are defined as follows:

GDPPC <sub>t-1</sub>	The real GDP per capita of each nation divided by 10 000 at time t-1. Obtained from the Penn World Tables version 7.1
CINFINS <sub>ct-1</sub>	The national values, attitudes, and beliefs towards post materialistic values (CPOSTMAT <sub>ct-1</sub> ) in Model 1, religion (CRELIGION <sub>ct-1</sub> ) in Model 2 and the family (CFAMILY <sub>ct-1</sub> ) in Model 3. CPOSTMAT <sub>ct-1</sub> is calculated using data from the World Values Survey. CRELIGION <sub>ct-1</sub> and CFAMILY <sub>ct-1</sub> were developed in Section 3(ii).
FEMALE <sub>irc,t</sub>	Binary variable equal to 1 if the individual is female. From the World Values Survey.
AGE <sub>irc,t</sub>	The age of the respondent measured in years. From the World Values Survey.
EDUC <sub>irc,t</sub>	The age at which the respondent finished their education. From the World Values Survey.
CHILDREN <sub>irc,t</sub>	Binary variable equal to 1 if the respondent has children. From the World Values Survey.
SEMP <sub>irc,t</sub>	Binary variable equal to 1 if the respondent is self-employed. From the World Values Survey.
EMP <sub>irc,t</sub>	Binary variable equal to 1 if the respondent is employed by someone else. From the World Values Survey.
STUD <sub>irc,t</sub>	Binary variable indicating if the respondent is a student. From the World Values Survey.
INCOME <sub>irc,t</sub>	Measures the 10% income bracket in which an individual places themselves within their country. From the World Values Survey.
WAVE <sub>t</sub>	Wave of the World Values Survey in which the individual observation was taken.

Model 1 finds support for H1 as GDPPC<sub>ct-1</sub> is positive and significant at the less than 1% level. This suggests that higher levels of economic growth in a nation lead to higher levels of post-materialistic values among its citizens. There is also evidence that post-materialistic values tend to increase in people as they approach their 22<sup>nd</sup> birthday, then diminish. This is consistent with Inglehart's (1971) finding that post-materialistic values develop in the youth of each nation. Post-materialist values are also higher, on average, amongst individuals who are either

students or who have a job, and become more prevalent the higher up the individual is on the income scale. Interestingly, parents tend to have lower levels of post-materialist values than individuals who do not have children. Two potential explanations are that individuals with higher post-materialistic values tend not to have children, or alternatively, that having children forces parents to focus on traditional values (or lower order values from Maslow's hierarchy of needs) to provide better material living conditions for their children.

Model 2 finds evidence to support H2, as  $GDPPC_{c,t-1}$  is negative and significant at the less than 5% level. This suggests that higher levels of economic growth in a nation lead to a decline in 'religiosity' among its citizens. This result is consistent with the findings of Norris and Inglehart (2004, p24-25), who observed that "virtually all advanced economies" were drifting towards a more secular orientation. The model also finds that females and parents tend to be more religious, and that prior national attitudes towards religion are an important determinant of current individual attitudes.

Model 3 finds evidence to support H3, as  $GDPPC_{c,t-1}$  is negative and significant at the less than 1% level. This suggests that as a nation becomes wealthier, its citizens place less value on the Judeo-Christian model of the family. Interestingly, individual attitudes towards the family are lower for females, people with a job, and those who are more educated. This is consistent with Tilley's (2012) interpretation of Marx and Engels (2002), and also some of the arguments put forwards by Engels (1958), as economic growth enables these groups to focus

more on their careers. The model also finds that people with children have a higher regard for the Judeo-Christian family than those without.

The three hypotheses tested in this paper are supported by both the univariate and multivariate analyses. This suggests that higher levels of economic growth in a nation leads to an increase in post-materialistic values in its citizens, but also to lower levels of religiosity and attitudes towards the Judeo-Christian family.

## **5 ROBUSTNESS TESTING**

Section 4 presented and interpreted the results of the univariate and multivariate analyses used to test the hypotheses developed by this paper. This section performs three robustness tests on each of the mixed level model to determine the sensitivity of the findings under different assumptions. The robustness tests proceed as follows: they (i) include conditional weights in the models to account for the probability of picking each individual within their country; (ii) re-estimate each model using the Restricted Likelihood estimation (as opposed to the Maximum Likelihood Estimation); and (iii) test the model for non-linearities.

### **(i) *Weights***

Section 4(ii) implicitly assumed that the sample from each nation is randomly selected. This robustness test relaxes this assumption by including the individual conditional weights for each observation as given by the World Values Survey. These weights come from variable S018, which is the “N preserving weightings, as

originally provided by participants” corrected “to give an N=1000” (World Values Survey 2014d). Table 13 presents the results of this robustness test.

**Table 8: Robustness Test – Weights**

		Model 1W	Model 2W	Model 3W
		IPOSTMAT <sub>irc,t</sub>	IRELIGION <sub>irc,t</sub>	IFAMILY <sub>irc,t</sub>
Fixed Effects	Constant	1.5923 (7.35)***	0.4024 (0.99)	-0.4547 (-1.24)
	GDPPC <sub>c,t-1</sub>	0.2266 (5.51)***	-0.1751 (-4.64)***	-0.3339 (-2.57)***
	CINFINS <sub>c,t-1</sub>	-0.0023 (-0.05)	0.3300 (12.87)***	0.0015 (0.11)
	FEMALE <sub>irc,t</sub>	0.0265 (2.34)**	0.2383 (7.04)***	-0.0657 (-1.82)*
	AGE <sub>irc,t</sub>	0.0047 (1.74)*	0.0035 (0.95)	-0.0025 (-0.72)
	AGE <sup>2</sup> <sub>irc,t</sub>	-0.0001 (-3.19)***	-0.0000 (-0.20)	0.0001 (-1.99)
	EDUC <sub>irc,t</sub>	0.0324 (9.10)***	-0.0206 (-3.20)***	-0.0151 (-2.59)***
	EDUC <sup>2</sup> <sub>irc,t</sub>	-0.0003 (-7.83)***	0.0003 (3.08)***	0.0001 (1.68)*
	CHILDREN <sub>irc,t</sub>	-0.0812 (-4.85)***	0.0369 (1.24)	0.1552 (5.96)***
	SEMP <sub>irc,t</sub>	0.0384 (1.84)*	-0.0185 (-0.66)	-0.0415 (-1.85)*
	EMP <sub>irc,t</sub>	0.0579 (3.55)***	-0.0691 (-2.08)**	-0.0448 (-1.55)
	STUD <sub>irc,t</sub>	0.1359 (4.82)***	-0.0145 (-0.50)	-0.0124 (-0.39)
	INCOME <sub>irc,t</sub>	0.0094 (1.99)**	-0.0082 (-2.09)**	0.0024 (0.54)
WAVE <sub>t</sub>	-0.0897 (-2.22)**	-0.0744 (-0.63)	0.2300 (2.77)***	
Random Effects	COUNTRY			
	Constant	0.9419	1.9769	0.6079
	WAVE <sub>t</sub>	0.0360	0.2542	0.0404
	Covariance	-0.1768	0.7089	-0.1492
	REGION			

	Constant	0.5966	0.1711	0.8877
	WAVE <sub>t</sub>	0.0229	0.0137	0.0627
	Covariance	-0.1141	-0.0425	-0.2331
Other	Observations	91913	19638	29627
	Wald $\chi^2$	286.26	1267.26	283.46
	Prob > $\chi^2$	0.000	0.000	0.000
	Log likelihood	-91373.814	-16123.531	-27977.593
	Akaike Criterion	182789.6	32289.06	55997.19

Table 13 presents the results of the mixed linear models testing the hypotheses developed in this paper with the inclusion of individual level conditional weights. The dependent variables in each of the models are IPOSTMAT<sub>irc,t</sub>, IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> which measure individual values, attitudes, and beliefs, towards post-materialist values, religion, and the family respectively. IPOSTMAT<sub>irc,t</sub> was taken from the World Values Survey. IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> were developed in Section 3(ii). The conditional weights of the individual level observations are taken from variable S018 of the World Values Survey. The table presents the coefficient for each of the fixed effects along with the t-ratio. \*, \*\* and \*\*\* are used to indicate significance at the less than 10%, 5% and 1% levels respectively for the one-tailed test. For each of the random effects the coefficient is reported for the constant (cluster intercept term), the WAVE<sub>t</sub> (random effect) and the covariance between the constant and the wave. The variables used in each of the models are defined as follows:

GDPPC <sub>t-1</sub>	The real GDP per capita of each nation divided by 10 000 at time t-1. Obtained from the Penn World Tables version 7.1.
CINFINS <sub>c,t-1</sub>	The national values, attitudes, and beliefs towards post materialistic values (CPOSTMAT <sub>c,t-1</sub> ) in Model 1, religion (CRELIGION <sub>c,t-1</sub> ) in Model 2 and the family (CFAMILY <sub>c,t-1</sub> ) in Model 3. CPOSTMAT <sub>c,t-1</sub> is calculated using data from the World Values Survey. CRELIGION <sub>c,t-1</sub> and CFAMILY <sub>c,t-1</sub> were developed in Section 3.3.
FEMALE <sub>irc,t</sub>	Binary variable equal to 1 if the individual is female. From the World Values Survey.
AGE <sub>irc,t</sub>	The age of the respondent measured in years. From the World Values Survey.
EDUC <sub>irc,t</sub>	The age at which the respondent finished their education. From the World Values Survey.
CHILDREN <sub>irc,t</sub>	Binary variable equal to 1 if the respondent has children. From the World Values Survey.
SEMP <sub>irc,t</sub>	Binary variable equal to 1 if the respondent is self-employed. From the World Values Survey.
EMP <sub>irc,t</sub>	Binary variable equal to 1 if the respondent is employed by someone else. From the World Values Survey.
STUD <sub>irc,t</sub>	Binary variable indicating if the respondent is a student. From the World Values Survey..
INCOME <sub>irc,t</sub>	Measures the 10% income bracket in which an individual places themselves within their country. From the World Values Survey.
WAVE <sub>t</sub>	Wave of the World Values Survey in which the individual observation was taken.

Table 8 shows that the inclusion of weights does not change the conclusions of Section 4(ii). Evidence to support H1 and H3 is the same, as GDPPC<sub>c,t-1</sub> has the expected sign in both models, and is significant at the less than 1% level. H2 finds more support with the inclusion of weights, as GDPPC<sub>c,t-1</sub> is negative, and is now significant at the less than 1% level. These results suggest that higher levels of economic growth in a society lead to higher levels of post-materialist values, and also lower levels of both religiosity and attitudes towards the Judeo-Christian understanding of the family.

**(ii) Restricted likelihood estimation**

The models estimated in Section 4(ii) were regressed using the maximum likelihood estimation, which can lead to negatively biased estimates of the variance components of the random effects, especially in the presence of small sample sizes. This robustness test analyses the potential bias by re-estimating the models using a restricted maximum likelihood procedure. Table 14 presents the results of the re-estimated models.

**Table 9: Robustness Test – Restricted Likelihood Estimation**

		Model 1R	Model 2R	Model 3R
		IPOSTMAT <sub>irc,t</sub>	IRELIGION <sub>irc,t</sub>	IFAMILY <sub>irc,t</sub>
Fixed Effects	Constant	1.7317 (7.59)***	0.3233 (0.86)	-0.3773 (-1.20)
	GDPPC <sub>c,t-1</sub>	0.2659 (6.63)***	-0.1696 (-1.87)*	-0.3360 (-4.07)***
	CINFINS <sub>c,t-1</sub>	-0.0161 (-0.53)	0.3127 (6.37)***	0.0025 (0.07)
	FEMALE <sub>irc,t</sub>	0.0200 (2.65)***	0.2124 (19.16)***	-0.0636 (-5.54)***
	AGE <sub>irc,t</sub>	0.0036 (2.46)**	0.0049 (2.27)**	-0.0016 (-0.70)
	AGE <sup>2</sup> <sub>irc,t</sub>	-0.0001 (-5.21)***	-0.0000 (-0.95)	0.0001 (2.32)**
	EDUC <sub>irc,t</sub>	0.0306 (24.72)***	-0.0225 (-8.39)***	-0.0171 (-6.10)***
	EDUC <sup>2</sup> <sub>irc,t</sub>	-0.0003 (-19.27)***	0.0003 (6.18)***	0.0002 (3.39)***
	CHILDREN <sub>irc,t</sub>	-0.0791 (-7.85)***	0.0375 (2.52)**	0.1347 (8.51)***
	SEMP <sub>irc,t</sub>	0.0278 (2.07)**	-0.0208 (-1.11)	-0.0557 (2.83)***
	EMP <sub>irc,t</sub>	0.0381 (4.05)***	-0.0490 (-3.62)***	-0.0390 (-2.77)***
	STUD <sub>irc,t</sub>	0.1108 (6.66)***	0.0053 (0.24)	-0.0002 (-0.01)
	INCOME <sub>irc,t</sub>	0.0074 (4.24)***	-0.0052 (-2.11)**	-0.0003 (-0.13)

	WAVE <sub>t</sub>	-0.1070 (-2.41)**	-0.0548 (-0.42)	0.2204 (2.72)***
Random Effects	COUNTRY			
	Constant	1.0479	1.9117	0.599
	WAVE <sub>t</sub>	0.0421	0.2542	0.0392
	Covariance	-0.2021	-0.6963	-0.1447
	REGION			
	Constant	0.8934	0.3599	0.9164
	WAVE <sub>t</sub>	0.0327	0.0281	0.066
	Covariance	-0.1674	-0.0943	-0.2413
Other	Observations	91913	19638	29627
	Wald $\chi^2$	1933.2	883.22	497.61
	Prob > $\chi^2$	0.000	0.000	0.000
	Log likelihood	-138455.51	-21779.597	-40044.168
	Akaike Criterion	n/a	n/a	n/a

Table 9 presents the results of the mixed linear models testing the hypotheses developed in this paper estimated using restricted likelihood estimation. The dependent variables in each of the models are IPOSTMAT<sub>irc,t</sub>, IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> which measure individual values, attitudes, and beliefs, towards post-materialist values, religion, and the family respectively. IPOSTMAT<sub>irc,t</sub> was taken from the World Values Survey. IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> were developed in Section 3(ii). The table presents the coefficient for each of the fixed effects along with the t-ratio. \*, \*\* and \*\*\* are used to indicate significance at the less than 10%, 5% and 1% levels respectively for the one-tailed test. For each of the random effects the coefficient is reported for the constant (cluster intercept term), the WAVE<sub>t</sub> (random effect) and the covariance between the constant and the wave. The variables used in each of the models are defined as follows:

GDPPC <sub>t-1</sub>	The real GDP per capita of each nation divided by 10 000 at time t-1. Obtained from the Penn World Tables version 7.1
CINFINS <sub>c,t-1</sub>	The national values, attitudes, and beliefs towards post materialistic values (CPOSTMAT <sub>c,t-1</sub> ) in Model 1, religion (CRELIGION <sub>c,t-1</sub> ) in Model 2 and the family (CFAMILY <sub>c,t-1</sub> ) in Model 3. CPOSTMAT <sub>c,t-1</sub> is calculated using data from the World Values Survey. CRELIGION <sub>c,t-1</sub> and CFAMILY <sub>c,t-1</sub> were developed in Section 3.3.
FEMALE <sub>irc,t</sub>	Binary variable equal to 1 if the individual is female. From the World Values Survey.
AGE <sub>irc,t</sub>	The age of the respondent measured in years. From the World Values Survey.
EDUC <sub>irc,t</sub>	The age at which the respondent finished their education. From the World Values Survey.
CHILDREN <sub>irc,t</sub>	Binary variable equal to 1 if the respondent has children. From the World Values Survey.
SEMP <sub>irc,t</sub>	Binary variable equal to 1 if the respondent is self-employed. From the World Values Survey.
EMP <sub>irc,t</sub>	Binary variable equal to 1 if the respondent is employed by someone else. From the World Values Survey.
STUD <sub>irc,t</sub>	Binary variable indicating if the respondent is a student. From the World Values Survey.
INCOME <sub>irc,t</sub>	Measures the 10% income bracket in which an individual places themselves within their country. From the World Values Survey.
WAVE <sub>t</sub>	Wave of the World Values Survey in which the individual observation was taken.

Table 9 shows that changing the estimation method used to regress the models do not change the findings for either H1 or H3. Both hypotheses continue to find strong support, as GDPPC<sub>c,t-1</sub> is still significant at the less than 1% level in Models 1R and 3R. This suggests that higher levels of economic growth lead to an increase

in post-materialist values, and a decline in attitudes towards the Judeo-Christian family within a nation. The alternative estimation method does, however, reduce the evidence in support of H2, as  $GDPPC_{c,t-1}$  is only significant at the less than 10% level in Model 2R. This suggests that the relationship between economic outcomes and religious attitudes found in Section 4(ii) is sensitive to the model estimation method.

### (iii) Testing for non-linearities

The final robustness test analyses the impact non-linearities have on the model. Each model from Section 4(ii) was examined for the presence of non-linearities (both squares and logarithms) in  $GDPPC_{c,t-1}$ ,  $CINFINS_{c,t-1}$ ,  $INCOME_{irc,t}$ , and  $WAVE_{rc,t}$ . Each model is then re-estimated with all significant non-linearities included. Table 10 presents the re-estimated models including the significant squared terms.

**Table 10: Robustness Test – Squares**

		Model 1S	Model 2S	Model 3S
		$IPOSTMAT_{irc,t}$	$IRELIGION_{irc,t}$	$IFAMILY_{irc,t}$
Fixed Effects	Constant	2.5832 (9.45)***	0.8770 (2.53)**	-0.4223 (-1.42)
	$GDPPC_{c,t-1}$	0.4346 (4.42)***	-0.6412 (-2.91)***	-0.3333 (-4.26)***
	$CINFINS_{c,t-1}$	0.1711 (1.93)*	0.4317 (7.52)***	0.0039 (0.12)
	$FEMALE_{irc,t}$	0.0200 (2.65)***	0.2122 (19.15)***	-0.0635 (-5.53)***
	$AGE_{irc,t}$	0.0035 (2.39)**	0.0049 (2.27)**	-0.0017 (-0.71)
	$AGE_{irc,t}^2$	-0.0001 (-5.13)***	-0.0000 (-0.96)	0.0001 (2.34)**



	EDUC <sub>irc,t</sub>	0.0308 (24.87)***	-0.0225 (-8.39)***	-0.0175 (-6.23)***
	EDUC <sub>irc,t</sub> <sup>2</sup>	-0.0003 (-19.42)***	0.0003 (6.18)***	0.0002 (3.51)***
	CHILDREN <sub>irc,t</sub>	-0.0777 (-7.71)***	0.0374 (2.51)**	0.1351 (8.53)***
	SEMP <sub>irc,t</sub>	0.0290 (2.16)**	-0.0211 (-1.12)	-0.0549 (-2.79)***
	EMP <sub>irc,t</sub>	0.0380 (4.04)***	-0.0494 (-3.65)***	-0.0404 (-2.87)***
	STUD <sub>irc,t</sub>	0.1146 (6.89)***	0.0053 (0.24)	-0.0001 (-0.00)
	INCOME <sub>irc,t</sub>	0.0073 (4.20)***	-0.0052 (-2.11)**	0.0307 (3.23)***
	WAVE <sub>t</sub>	-0.5644 (-6.91)***	-0.1572 (-1.48)	0.2169 (2.85)***
	GDPPC <sub>c,t-1</sub> <sup>2</sup>	-0.0721 (-3.10)***	0.2562 (2.14)**	-
	CINFINS <sub>c,t-1</sub> <sup>2</sup>	-0.0434 (-2.11)**	-0.1549 (-2.94)***	-
	INCOME <sub>irc,t</sub> <sup>2</sup>	-	-	-0.0030 (-3.39)***
	WAVE <sub>t</sub> <sup>2</sup>	0.0491 (6.39)***	-	-
Random Effects	COUNTRY			
	Constant	0.9196	1.0428	0.5154
	WAVE <sub>t</sub>	0.0359	0.1425	0.0331
	Covariance	-0.1757	-0.3855	-0.1234
	REGION			
	Constant	0.9311	0.3458	0.9035
	WAVE <sub>t</sub>	0.0337	0.0276	0.065
	Covariance	-0.1738	-0.0915	-0.2378
Other	Observations	91913	19638	29627
	Wald $\chi^2$	1995.11	918.75	512.63
	Prob > $\chi^2$	0.000	0.000	0.000
	Log likelihood	-138360.04	-21714.593	-39977.793
	Akaike Criterion	276768.1	43461.19	79999.59
	LR test with original model	55.60***	-	11.45***

Table 10 re-estimates the models from Table 7 with the inclusion of the significant squared terms to account for non-linearities. The dependent variables in each of the models are IPOSTMAT<sub>irc,t</sub>, IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> which measure individual values, attitudes, and beliefs, towards post-materialist values, religion, and the family respectively. IPOSTMAT<sub>irc,t</sub> was taken from the World Values Survey. IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> were developed in Section 3(ii). The table presents the coefficient for each of the fixed effects along with the t-ratio. \*, \*\* and \*\*\* are used to indicate significance at the less than 10%, 5% and 1% levels respectively for the one-tailed test. For each of the random effects the

coefficient is reported for the constant (cluster intercept term), the  $WAVE_t$  (random effect) and the covariance between the constant and the wave. The variables used in each of the models are defined as follows:

$GDPPC_{t-1}$	The real GDP per capita of each nation divided by 10 000 at time t-1. Obtained from the Penn World Tables version 7.1
$CINFINS_{c,t-1}$	The national values, attitudes, and beliefs towards post materialistic values ( $CPOSTMAT_{c,t-1}$ ) in Model 1, religion ( $CRELIGION_{c,t-1}$ ) in Model 2 and the family ( $CFAMILY_{c,t-1}$ ) in Model 3. $CPOSTMAT_{c,t-1}$ is calculated using data from the World Values Survey. $CRELIGION_{c,t-1}$ and $CFAMILY_{c,t-1}$ were developed in Section 3.3.
$FEMALE_{irc,t}$	Binary variable equal to 1 if the individual is female From the World Values Survey.
$AGE_{irc,t}$	The age of the respondent measured in years. From the World Values Survey.
$EDUC_{irc,t}$	The age at which the respondent finished their education. From the World Values Survey.
$CHILDREN_{irc,t}$	Binary variable equal to 1 if the respondent has children. From the World Values Survey.
$SEMP_{irc,t}$	Binary variable equal to 1 if the respondent is self-employed. From the World Values Survey.
$EMP_{irc,t}$	Binary variable equal to 1 if the respondent is employed by someone else. From the World Values Survey.
$STUD_{irc,t}$	Binary variable indicating if the respondent is a student. From the World Values Survey.
$INCOME_{irc,t}$	Measures the 10% income bracket in which an individual places themselves within their country. From the World Values Survey.
$WAVE_t$	Wave of the World Values Survey in which the individual observation was taken.

Model 1S finds evidence of a non-linear relationship between the economic growth of a nation and the post-materialistic values of its citizens, as  $GDPPC_{c,t-1}^2$  is significant at the less than 1% level. The findings suggest, *ceteris paribus*, that an increase in the GDP per capita of a nation with a GDP per capita below (above) \$179 140 will lead to an increase (decrease) in the post-materialistic values of individuals within that nation. This finding is meaningless, as no nation has a real GDP per capita above \$179 140. An increase in GDP per capita in a nation will therefore lead to an increase in post-materialist values among its citizens. This effect, however, diminishes as nations become richer. Thus, the findings of Model 1S support H1.

Model 2S finds evidence of a non-linear relationship between the economic growth of a nation and the religiosity of its citizens, as  $GDPPC_{c,t-1}^2$  is significant at the less than 5% level. The findings suggest that an increase in GDP per capita in a nation with a GDP per capita below (above) \$12 514 will lead to a decrease (increase) in the religiosity of its citizens. This finding is unexpected, as it suggests that economic growth will lead to a decline in religiosity up to a point, and then

further economic growth will lead to an increase in religiosity. A closer inspection of this result reveals that  $GDPPC_{c,t-1}^2$  is not significant if  $CRELIGION_{c,t-1}^2$  is removed from the model. Furthermore, re-estimating Model 2S using restricted likelihood estimation leads to  $GDPPC_{c,t-1}^2$  becoming insignificant. Estimating Model 2S with condition weights, however, leads to  $GDPPC_{c,t-1}^2$  being significant at the less than 5% level.  $GDPPC_{c,t-1}^2$  also remains significant at the less than 5% level when  $CRELIGION_{c,t-1}^2$  is dropped. These findings suggest that the non-linear relationship between economic growth and religiosity is sensitive to the estimation method used to develop the model.

There is no change to the support for H3, as  $GDPPC_{c,t-1}$  is negative and significant in Model 3S at the less than 1% level. There is no indication of a non-linear relationship between  $IFAMILY_{irc,t}$  and  $GDPPC_{c,t-1}$ .

Each of the models estimated in Table 15 marginally outperform their corresponding model in Table 12, as seen by the lower Akaike Criterion scores, and the significant likelihood-ratio tests (with the exception of Model 2S where the likelihood-ratio test failed).

Table 11 continues this robustness test by presenting the re-estimated models with the addition of the significant logarithmic terms<sup>8</sup>.

### **Table 11: Robustness Test – Logarithms**

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<sup>8</sup> The logarithms of  $CINFINS_{c,t-1}$  were generated by first increasing  $CINFINS_{c,t-1}$  by 3 to ensure that all values are positive.

		Model 1L	Model 2L	Model 3L
		IPOSTMAT <sub>irc,t</sub>	IRELIGION <sub>irc,t</sub>	IFAMILY <sub>irc,t</sub>
Fixed Effects	Constant	0.0179 (0.01)	-6.3225 (-3.85)***	-0.3826 (-1.29)
	GDPPC <sub>c,t-1</sub>	-0.0187 (-0.27)	0.5241 (2.71)***	-0.3334 (-4.36)***
	CINFINS <sub>c,t-1</sub>	-0.5388 (-2.19)**	-1.4552 (-3.24)***	0.0037 (0.11)
	FEMALE <sub>irc,t</sub>	0.0200 (2.65)***	0.2123 (19.16)***	-0.0633 (-5.51)***
	AGE <sub>irc,t</sub>	0.0035 (2.39)**	0.0049 (2.26)**	-0.0016 (-0.70)
	AGE <sub>irc,t</sub> <sup>2</sup>	-0.0001 (-5.12)***	-0.0000 (-0.95)	0.0001 (2.34)**
	EDUC <sub>irc,t</sub>	0.0308 (24.87)***	-0.0225 (-8.39)***	-0.0175 (-6.23)***
	EDUC <sub>irc,t</sub> <sup>2</sup>	-0.0003 (-19.42)***	0.0003 (6.17)***	0.0002 (3.50)***
	CHILDREN <sub>irc,t</sub>	-0.0774 (-7.68)***	0.0375 (2.52)**	0.1349 (8.52)***
	SEMP <sub>irc,t</sub>	0.0291 (2.17)**	-0.0211 (-1.12)	-0.0550 (-2.80)***
	EMP <sub>irc,t</sub>	0.0382 (4.07)***	-0.0491 (-3.63)***	-0.0402 (-2.85)***
	STUD <sub>irc,t</sub>	0.1159 (6.96)***	0.0052 (0.23)	0.0004 (0.02)
	INCOME <sub>irc,t</sub>	0.0075 (4.28)***	-0.0053 (-2.13)**	-0.0243 (-3.31)***
	WAVE <sub>t</sub>	0.2987 (3.86)***	-0.1190 (-1.12)	0.2167 (2.84)***
	ln(GDPPC <sub>c,t-1</sub> )	0.2276 (3.11)***	-0.4685 (-4.16)***	-
	ln(CINFINS <sub>c,t-1</sub> + 3)	2.6072 (2.21)**	5.6202 (3.98)***	-
	ln(INCOME <sub>irc,t</sub> )	-	-	0.0972 (3.48)***
ln(WAVE <sub>t</sub> )	-1.8876 (-6.48)***	-	-	
Random Effects	COUNTRY			
	Constant	0.8931	1.3270	0.5139
	WAVE <sub>t</sub>	0.0349	0.1586	0.0332
	Covariance	-0.1706	-0.4587	-0.1234
	REGION			
Constant	0.9281	0.3252	0.9074	

	WAVE <sub>t</sub>	0.0337	0.0263	0.0652
	Covariance	-0.1734	-0.0863	-0.2386
Other	Observations	91913	19638	29627
	Wald $\chi^2$	1992.84	942.21	513.25
	Prob > $\chi^2$	0.000	0.000	0.000
	Log likelihood	-138361.34	-21711.871	-39977.467
	Akaike Criterion	276770.7	43469.74	79998.93
	LR test with original model	53.00***	13.28***	12.10***

Table 11 re-estimates the models from Table 7 with the inclusion of the significant logarithmic terms to account for non-linearities. The dependent variables in each of the models are IPOSTMAT<sub>irc,t</sub>, IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> which measure individual values, attitudes, and beliefs, towards post-materialist values, religion, and the family respectively. IPOSTMAT<sub>irc,t</sub> was taken from the World Values Survey. IRELIGION<sub>irc,t</sub> and IFAMILY<sub>irc,t</sub> were developed in Section 3(ii). The table presents the coefficient for each of the fixed effects along with the t-ratio. \*, \*\* and \*\*\* are used to indicate significance at the less than 10%, 5% and 1% levels respectively for the one-tailed test. For each of the random effects the coefficient is reported for the constant (cluster intercept term), the WAVE<sub>t</sub> (random effect) and the covariance between the constant and the wave. The variables used in each of the models are defined as follows:

GDPPC <sub>t-1</sub>	The real GDP per capita of each nation divided by 10 000 at time t-1. Obtained from the Penn World Tables version 7.1
CINFINS <sub>c,t-1</sub>	The national values, attitudes, and beliefs towards post materialistic values (CPOSTMAT <sub>c,t-1</sub> ) in Model 1, religion (CRELIGION <sub>c,t-1</sub> ) in Model 2 and the family (CFAMILY <sub>c,t-1</sub> ) in Model 3. CPOSTMAT <sub>c,t-1</sub> is calculated using data from the World Values Survey. CRELIGION <sub>c,t-1</sub> and CFAMILY <sub>c,t-1</sub> were developed in Section 3.3.
FEMALE <sub>irc,t</sub>	Binary variable equal to 1 if the individual is female. From the World Values Survey
AGE <sub>irc,t</sub>	The age of the respondent measured in years. From the World Values Survey
EDUC <sub>irc,t</sub>	The age at which the respondent finished their education. From the World Values Survey
CHILDREN <sub>irc,t</sub>	Binary variable equal to 1 if the respondent has children. From the World Values Survey
SEMP <sub>irc,t</sub>	Binary variable equal to 1 if the respondent is self-employed. From the World Values Survey
EMP <sub>irc,t</sub>	Binary variable equal to 1 if the respondent is employed by someone else. From the World Values Survey
STUD <sub>irc,t</sub>	Binary variable indicating if the respondent is a student. From the World Values Survey.
INCOME <sub>irc,t</sub>	Measures the 10% income bracket in which an individual places themselves within their country. From the World Values Survey.
WAVE <sub>t</sub>	Wave of the World Values Survey in which the individual observation was taken.

The findings from Table 16 are almost identical to those in Table 15. Model 1L finds that an increase in the GDP per capita in a nation with a GDP per capita below (above) \$121 711 will lead to an increase (decrease) in the post-materialistic values of that nation's citizens. This finding is consistent with the one from Model 1S, as all nations in the sample have a GDP per capita lower than \$121 711. This result therefore gives further evidence in support for H1, as higher levels of GDP per capita lead to an increase in post-materialist values of a nation's citizens.

Like Model 2S, Model 2L finds evidence of a non-linear relationship between economic growth and religiosity, as  $\ln(\text{GDPPC}_{c,t-1})$  is significant at the less than 1% level. The findings suggest that an increase in GDP per capita of a nation with a GDP per capita below (above) \$8 939 will lead to a decrease (increase) in the religious attitudes of that nation's citizens. As with Model 2S, this result was investigated further, and it was found that  $\ln(\text{GDPPC}_{c,t-1})$  is not significant if  $\ln(\text{CRELIGION}_{c,t-1} + 3)$  is removed from the model. Re-estimating Model 2L using restricted likelihood estimation produced evidence of a non-linear relationship, as  $\ln(\text{GDPPC}_{c,t-1})$  is significant at the less than 1% level. However, removing  $\ln(\text{CRELIGION}_{c,t-1} + 3)$  from restricted likelihood model makes  $\ln(\text{GDPPC}_{c,t-1})$  statistically insignificant. In a similar finding to Model 2S,  $\ln(\text{GDPPC}_{c,t-1})$  is significant at the less than 1% when conditional weights are used.

There is no change to the support for H3, as  $\text{GDPPC}_{c,t-1}$  is negative and significant in Model 3L at the less than 1% level. There is no indication of a non-linear relationship between  $\text{IFAMILY}_{irc,t}$  and  $\text{GDPPC}_{c,t-1}$ .

This section examined the robustness of the models estimated in Section 4(ii) in three ways. Firstly, in Section 5(i), the individual conditional weights attached to each observation from the World Values Survey were included in the model design to ensure representative samples were drawn from each nation. The inclusion of the individual weights did not materially affect the conclusions from Section 4, as evidence was found to support each of the three hypotheses tested by this paper.

The second robustness test, undertaken in Section 5(ii), regressed the models using restricted likelihood estimation. The use of restricted likelihood estimation instead of maximum likelihood estimation did not affect the findings for H1 or H3. The choice of estimation procedure did, however, affect the findings for H2, as Section 5(ii) only found weak evidence of a negative relationship between past economic growth and current levels of religiosity.

Section 5(iii) presented the results of the third and final robustness test, which tested for non-linearities in the model. The inclusion of non-linearities does not affect the findings in relation to H1 or H3. Evidence was found, however, that religiosity has an inverted 'u-shaped' relationship with past economic growth. This finding, however, is sensitive to the model estimation method, and whether past national levels of religiosity were included in the model as a non-linear term.

Section 5 therefore concludes that the findings in relation to H1 and H3 are robust, as there is strong evidence that an increase in the level of GDP per capita within a nation will lead to an increase in post-materialist values, and a decrease in attitudes towards the Judeo-Christian family. The findings in relation to H2, however, are not robust, as the statistical significance of the relationship between economic growth and religiosity depends upon the estimation method used to regress the model. Furthermore, there is evidence of a non-linear relationship between economic growth and religious beliefs within a nation, where increasing economic growth leads to a decrease (increase) in religious belief in poorer (richer) nations.

## 6 CONCLUSION

### *Overview and discussion*

This paper empirically tested the Grand Transition view that economic growth shapes informal institutions, which are defined as collections of convention, values, attitudes, beliefs and social norms. Following the existing literature this paper chose post-materialist values, religiosity and attitudes towards the family as three informal institutions to form the basis of testing of the GT view. Three hypotheses have been developed to investigate this, one for each informal institution. These hypotheses predict that higher levels of economic growth within a nation will lead to citizens having higher levels of post-materialist values, and lower levels of both religiosity and attitudes towards the nuclear family. While post-materialist values are measured directly by the World Values Survey (2014), this paper used principal component factor analysis to create measures for religiosity and attitudes towards the family. Three Mixed Level Models were estimated to analyse how each of these informal institutions is shaped by economic growth.

The results show that as a nation becomes more economically developed, citizens develop higher levels of post-materialist values. This finding is consistent with those of Inglehart (1971), Abramson and Inglehart (1986, 1987), and Maslow's (1943) the hierarchy of needs. Evidence was also found to suggest that, as a nation becomes more developed, its citizens will experience a decline in their religiosity. This finding is consistent with the theory developed by Norris and Inglehart (2004), and the instrumental variable analysis of Barro and McCleary (2006a). This finding, however, is sensitive to the model estimation method used.



Furthermore, there is evidence that this relationship may be non-linear, whereby increasing economic growth leads to a decrease (increase) in religiosity in poorer (richer) nations. Finally, this paper found that as a nation becomes more economically developed, its citizens will place less importance on the Judeo-Christian concept of the family. This finding is consistent with Tilley's (2012) interpretation of the Communist Manifesto, and also Sterns (1948) perspective on Engels understanding of the family.

### ***Limitations and future research***

The major limitation of this paper is a restriction on the availability of data. This limitation is primarily driven by the unbalanced nature of the World Values Survey, and the continual updates to the questions asked in each wave of the Survey. Despite this limitation, this paper developed a framework which other researchers may replicate to test the relationship between other informal institutions and economic growth.

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