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# The religious transition

## A long-run perspective

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**Abstract** Religiosity is defined as the importance of religion in all aspects of life. The definition is operationalized into a robust measure by aggregating 14 items from the World Values Surveys. Religiosity falls by 50% when countries pass through the transition from being underdeveloped to becoming a developed one. A formal test shows that long-run causality is predominantly from income to religiosity. The transition slope is robust to measurement error and composition of the country sample. The empirical macro relation is rationalized by some micro theory: Most components of the demand for religious goods are reduced by rising income. Churches supply religious goods directly and through three additional channels: education, healthcare and social security. Rising income caused churches to lose control over the additional channels.

**Keywords** Religiosity · economic development · transition · substitution · biogeography

**JEL classification** O11 · Z12

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## 1. Introduction: Religiosity and development

Religiosity is defined as the importance of religion in all aspects of life. The paper develops this definition into an applied macro measure of religiosity and demonstrates that it falls by 50% when countries pass through the transition from being underdeveloped to becoming a developed one. While religiosity falls, religions stay remarkably stable over time. Path dependency and differences across religions add considerable variation to the relation between income and religiosity, but the transition can be generalized.

Religiosity has been discussed from many perspectives. Ours is growth and development economics, notably the theory of the *Grand Transition* (GT) whereby long-run development causes a transition in most socio-economic variables from a traditional to a modern equilibrium. We show that the general pattern also applies to religiosity.

The religiosity measure aggregates 14 items from the *World Values Surveys*. The WVS questionnaire was developed as an English master version, which defines the terminology used. It has been translated into many languages and cultural environments by experts in each country. This is a difficult task: Key concepts, such as *God* and *church*, have a clear meaning in monotheistic religions, but seem less relevant in other belief systems. However, the countries of South and East Asia fit well into the general pattern.

The paper discusses a process of transition that evolves over one to two centuries in countries with persistent economic development. The sample has 240 data points, which span 24 years and 95 countries. These data seem inadequate for the task at hand, but an amazingly strong pattern emerges. It is as predicted by the transition hypothesis.

Section 2 presents our GT-frame of reference, defines our concept of religiosity, and discusses how it relates to two main controversies in the literature: The secularization controversy, where multiple definitions allow some confusion about the basic facts, and the family of controversies about the effect of various religions on development. Our concepts turn both controversies into empirical questions – we concentrate on answering the first. Sections 3 to 5 are the core of the paper. It deals with the empirics of the religious transition. Section 3 explains how the definition of religiosity is developed into the $R$-variable. Its robustness is analyzed by studying how it reacts to the waves of the WVS, where both items and countries change substantially. Section 4 reports a long-run causality test showing that income, $y$, causes religiosity, $R$, not vice versa. Section 5 contains a study of the transition function $R = R(y)$. Its robustness is analyzed by binary dummies for country groups and religions and by systematic deletion of countries and groups of which China and the United

States are shown to be the main outliers.

Section 6 discusses the demand and supply of religion. The demand for religion as a factor of production falls with rising income through a process of substitution with science. Supply is analyzed by the *loss-of-channels theory*. Religious goods are supplied directly by churches and through three additional channels: Education, healthcare, and social security. The GT has shifted ownership and control over these channels from church to state. Section 7 concludes.

An online appendix (Paldam and Gundlach 2012) presents details of the religiosity data and further robustness tests. Also available online is a formal growth model that is consistent with the observed religious transition (Gundlach and Paldam 2012).

## 2. A frame of reference and an introduction to the literature

To explore the development of the important socio-economic factor of religiosity we need a frame of reference and empirically applicable concepts. The literature survey covers only the relevant article seen from this perspective – so the survey is highly selective.

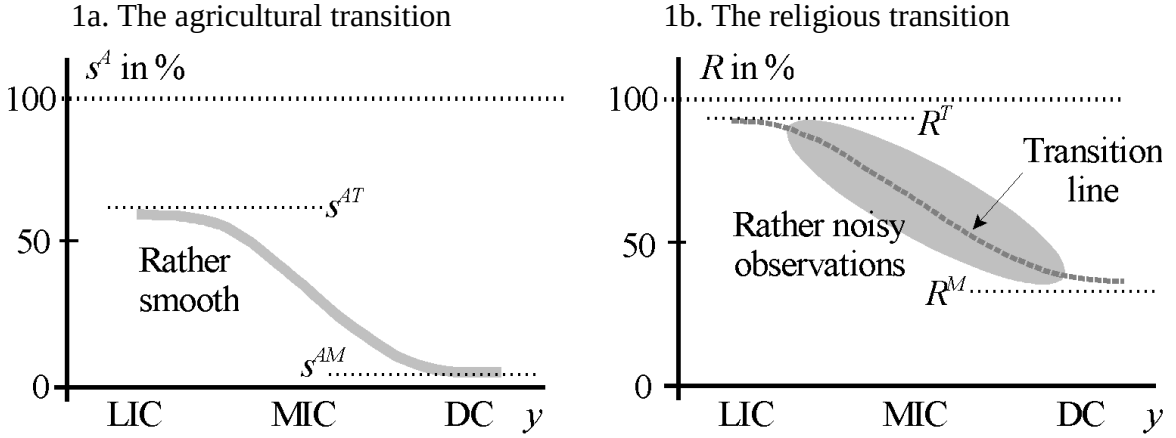
### 2.1. The Grand Transition and the concepts of religion and religiosity[1]

The GT (Grand Transition) framework claims that the process of long-run development consists of interacting transitions in most socio-economic variables. A transition is a shift from a traditional to a modern level of the variable, which is driven by income, $y$.

The transition of a variable, such as religiosity, $R$, has four features: (T1) causality is from $y$ to $R$; (T2) the high traditional level, $R^T$, is stable; (T3) the transition has a negative slope, $\lambda < 0$; (T4) the modern level, $R^M$, is stable as well. The transition explains only some of the variation in the $R$-data, but when the whole income range is considered it is a substantial part, such as half of the variation. The GT normally takes one to two centuries to unfold, but some cases are known in which it has taken half a century only. The least controversial of the many transitions is the agricultural transition. Here the abundant data show a fairly smooth process looking like Figure 1a.

[1] Transitions may cause increases or decreases in the transition variable. Only the latter possibility is considered in this section. It builds on the survey of the theory in Paldam and Gundlach (2008), while Gundlach and Paldam (2009a, 2009b and 2011) and Bjørnskov and Paldam (2012) are empirical studies of other transitions.

Figure 1. A sketch of the agricultural and the religious transitions




Note: The horizontal axis is income, i.e., the logarithm to GDP per capita. LIC is low income country, MIC is middle income country, and DC is developed country. The vertical axes are $s^A$, the share of agriculture in total GDP, and $R$, the measure of religiosity discussed in the text. The superscripts T and M are used to designate the traditional and modern level of the transition variables.

Figure 1b is a preview of our findings about the religious transition. Far less data are available and the transition is much noisier. Our hypothesis is that ideal data would reveal the typical form of a transition curve, $R = R(y)$, shown as the dotted transition line. To study the curve an 'economic' operationalization of the concepts of religion and religiosity is needed:

A *religion* is a package of 'goods'. Much like education, religions are complex in both the supply and demand dimensions. It is produced (often jointly with other goods) in two ways: by churches and within families.[2] It is used in two ways: as a factor of production and for consumption. Religion is used as a factor of production, for instance when farmers pray for a good harvest,[3] or political leaders are blessed by religious ceremonies. Religion is consumed where people go to places of worship to achieve peace of mind. Economics seems well suited to analyze the effects of rising income on the changing demand for religion as a factor of production and on the changing supply of collective goods by churches. It is more difficult to analyze the effect of income on the demand for religion as a consumption good.

*Religiosity* is the (relative) *amount* of the goods, reflecting the intensity of its use. It is the weight in everyday decision-making given to religion – which might be any religion. The stock of religious beliefs is probably constant, but the relevance of these beliefs for decision-making may change depending on the level of development.

These concepts suggest that religions are treated as a set of binary dummies, which are

[2] We assume that home production is proportional to church production.
[3] One of the authors has experienced a whole town in the Sahel zone united in a communal prayer for rain.

used for controls, and that religiosity is quantifiable. This is done in section 3.

The decline of religiosity is similar to the declining weight of agriculture in the process of development. In poor countries, the share of agriculture in GDP is high. In rich countries the share seems to converge towards zero, but people still eat. Hence, a low level of religiosity does not necessarily mean that people do not believe.

### 2.2. The literature: Relevant macro controversies and micro theory of dubious relevance

A major macro controversy deals with the unclear concept of secularization.[4] It originated as a component of the theory of *modernization* that goes back to Marx, Freud, Weber, Durkheim, and others. They predicted that economic development would cause both religions and religiosity to vanish. Religion has remained rather stable, and perhaps this is why Stark and Iannaccone (1994) claim that "secularization is a myth".

By contrast, McCleary and Barro (2006) apply a quantitative approach and find that various indicators of religiosity fall with rising income. Their results are generalized to much more data and a rationalization is provided. If the reader agrees that this is an operational, qualitative version of the secularization hypothesis then secularization is a fact.

As religiosity falls with development, churches have an interest in resisting development, notably of science. This explains the well-known feuds between religion and science and why churches in many countries form alliances with conservative political forces. Thus, it leads to the second macro controversy: The family of theories that deals with the causal role of various religions for development, i.e., with the reverse causality of the one studied.

Most reverse theories argue that a certain religion is socially conservative and hence delays development. For long, the East Asian countries had no development, and in the inter-war period theories appeared about the anti-developmental nature of the belief systems in East Asia,[5] but then things changed. A more recent literature sees Islam as a relatively rigid religion, preserving belief-based traditions from the 7$^{th}$ century, such as the traditional gender roles that keep women out of the labor market; see Paldam (2009) for a survey. A different reverse theory was proposed by Weber (1904), who argued that certain religious minorities, precisely because they are in opposition to mainstream conservative religion, have had a

[4] The literature is enormous and written by authors of many trades; see Iannaccone (1998) and Eklund *et al.* (2006) for surveys of the economics literature. The many concepts of secularization are not discussed. The article on secularization in Wikipedia lists about 10 definitions of which some are quite different.

[5] The main argument was developed by J.H. Boeke, 1884-1956. His books are only partly translated (from Dutch), but a summary is available in Higgins (1959).

causal role in economic development, notably in the rise of capitalism.

At present this is not our subject, but it is touched upon indirectly in two ways: The estimate of the transition slope, $\lambda$, is controlled for reverse causality and for the main religious affiliations. Both tests show that $\lambda$ is robust. Consequently, our results suggest that belief-based traditions do not have anti- or pro-developmental effects in the long run.

The micro theory of the economics of religiosity does not explicitly address the religious transition, although links may be developed on the demand side:

Azzi and Ehrenberg (1975) consider the time allocation to religious and non-religious activities at the household level in response to changes in the budget constraint. Durkin and Greely (1991) study the relationship between the demand for religion and the prevalence of risk in modern society. Lipford *et al.* (1993) investigate the link connecting religiosity to social behavior. We have had these theories in mind in section 6 below.

The supply side is dominated by the *competition theory*; see Finke and Iannacone (1993), Stark and Iannaccone (1994). Here, religiosity is a function of the degree of competition in the market for religion, with competition increasing the efficient supply of religious goods that generates its own demand. The theory explains why religiosity differs across countries at the same income level, but it does not address the religious transition.[6] The loss-of-channels theory presented in section 6 deals with the observed religious transition.

When religion is treated as a good and analyzed with the tools of economics, the observed level of religiosity reflects the equilibrium of demand and supply. Economic theory suggests that the outcome will be conditional on the level of income.

## 3. The applied religiosity variable, *R*: The factor analysis and robustness

The religious transition is a relation $R = R(y)$. This section develops the two variables.

The exogenous variable is *y*, *income*, defined as the natural logarithm of GDP per capita, which is taken from the Maddison data set. Changes in *y* are in logarithmic points. Each point is a change in GDP per capita of $e \approx 2.7$ times.[7] GT-theory claims that GDP is a fine proxy for development. It may miss some aspects of development, but no better parsimonious variable is available, anyhow. The endogenous variable is religiosity, *R*.

[6] The theory does provide an explanation of the remarkable religiosity of the United States, but Opfinger (2011) reports that the theory fails in a cross-country perspective, using our *R*-variable.

[7] Source: Maddison (2003) and the Maddison homepage. We use the update of February 2010, posted one month before Maddison passed away. A few observations are assessed using the WDI data set.

3.1. Developing an applied *R*-variable from WVS items by factor analysis

If the importance of religion was measured in all aspects of life by $\hat{K}$ variables, $\hat{R}$ would be the largest common factor in all these variables. The actual *R*-variable is estimated by a factor analysis of $K = 14$ items from the *World Values Surveys* (WVS); see Inglehart *et al.* (1998, 2004). The items are chosen to span as much of the aspect space as possible. They all disregard the respondent's religious affiliation, if any, but ask about religion's importance in various spheres of life. The number used from each poll is the fraction (as a percentage) of the respondents giving the high importance answer. The aggregate *R*-score is in percentages as well. Changes in *R* are thus in percentage points.

Table 1. The 14 religiosity items: Short definitions and some counts

| Content of item (more detailed in Table A2) | Countries where each item was polled | | | | | | Avg. score | Corr. to |
|---|---|---|---|---|---|---|---|---|
| | Wave 1982 | Wave 1990 | Wave 1995 | Wave 2000 | Wave 2005 | All Sum | % | $y$ [a)] |
| 1. God very important in life | 20 | 37 | 51 | 69 | 52 | 229 | 62.2 | -0.53 |
| 2. Family should teach children faith | 21 | 43 | 53 | 68 | 52 | 237 | 32.7 | -0.52 |
| 3. Religion important in life | | 42 | 53 | 69 | 51 | 215 | 38.4 | -0.55 |
| 4. Better if more people are strongly religious | | | | | 43 | 43 | 33.4 | -0.68 |
| 5. Believes in god | 19 | 35 | 50 | 67 | | 171 | 82.1 | -0.32 |
| 6. Churches answer family life problems | 16 | 35 | | 67 | 46 | 164 | 51.9 | -0.53 |
| 7. Has moments of prayer and meditation | | | | | 44 | 44 | 75.4 | -0.44 |
| 8. Attend religious service regularly | 21 | 40 | 51 | 69 | 51 | 232 | 40.7 | -0.43 |
| 9. Churches answer social problems | | 35 | | 67 | 45 | 147 | 42.3 | -0.50 |
| 10. Churches answer moral problems | 16 | 35 | | 67 | 45 | 163 | 55.8 | -0.58 |
| 11. Non-believers are unfit for political office | | | | 64 | 43 | 107 | 54.4 | -0.66 |
| 12. Are a religious person | 21 | 42 | 50 | 68 | 52 | 233 | 68.6 | -0.44 |
| 13. Churches answer spiritual needs | 16 | 35 | | 67 | 45 | 163 | 69.4 | -0.49 |
| 14. Belongs to religious denomination | 21 | 41 | 52 | 69 | | 183 | 79.9 | -0.19 |
| Sum or – in the last two columns – averages | 171 | 420 | 360 | 811 | 569 | 2331 [b)] | 56.2 | -0.49 |
| Number of countries in wave | 21 | 43 | 54 | 70 | 52 | 240 [c)] | 95 [d)] | |
| Missing observations, in % of total possible | -41.8 | -30.2 | -52.4 | -17.2 | -21.8 | -30.6 | | |

Note: The online appendix shows the countries included in the waves. The order of the 14 items is per factor loading in Table 2. The polls of each wave are normally done over 2-3 years with the year mentioned as the "peak" year. Note that (a) $y$ is income = ln GDP per capita. (b) $M$, number of items polled. (c) $N$, number of polls. (d) $N_c$, number of countries included in at least one wave.

The WVS span only 24 years, so the analysis hinges crucially upon the *equivalence assumption* that the *within* (time-series) slope is the same as the *between* (cross-country)

slope. Countries started from rather similar levels of development about 300 years ago, so the cross-country differences in present income levels reflect the long-run path of development since then. The online appendix gives a formal test of the equivalence of the within and between-country slopes. Data limitations reduce the power of the test, but it is not rejected. The equivalence assumption holds fairly well for transitions with more adequate data (Gundlach and Paldam 2010).

Table 1 gives a short version of the question asked in the 14 items, and the number of times it has been asked in each of the five waves. $M$ = 2,331 refers to the number of polled items in the sample; $j$ = 1,…14 are the items, $i$ = 1,…, 95 are the countries, and $t$ = 1,…, 5 are the waves.

The two gray columns to the right report two important statistics. The first is the average $A_j$ of each of the items across all countries and waves, representing the average share of "high importance" attributed to each item by survey respondents. The grand average of all averages $A$ is 56.2%, which is thus the fraction of the respondents in all polls that declare themselves very religious. The second gray column shows the coefficient of correlation of the $A_{it}$'s and income $y_{it}$ for each $j$. The least significant of the correlations (item 14) just passes the 5% level (on a two-tailed test), so all correlations are statistically significant and negative, and nearly all are substantial in size.

### 3.2. Factor 1 is chosen as the *R*-variable as it is positive, large and stable

The factor analysis of the religiosity items presented in Table 2 is done independently for each wave. Our criteria for accepting one factor as the religiosity variable are: Its factor loadings to all items are positive, large and stable, as measured by the cross-wave t-ratios in the right-hand column.

Factor 1 fulfils these criteria: It is the dominating factor with an average eigenvalue of 7.4 and a cross-wave t-statistic of 12.0. All items have positive and mostly large loadings to factor 1. The cross-wave t-ratios are in the range from 6.7 to 150.2. Factor 1 taps into a latent variable that is very salient for the respondents. Thus, factor 1 is our *R*-variable.

Factor 2 has an average eigenvalue of 1.32, which is unstable across waves. It mainly loads to the institutional items and will not be discussed further. The third and higher factors are of no consequence.

Row 15 in Table 2 shows that factor 1 loads negatively to income. Even if it rises as the sample comes to cover more of the income range, the cross-wave stability is still -8.3.

Table 2. Factor analysis done for each wave separately

| Factor 1 is chosen as our *R*-variable | Results for individual waves | | | | | Across waves | |
|---|---|---|---|---|---|---|---|
| | 1982 | 1990 | 1995 | 2000 | 2005 | Avg. | t-ratio |
| Eigenvalue for Factor 1 | 6.50 | 6.85 | 5.67 | 9.17 | 8.95 | 7.43 | 12.0 |
| Eigenvalue for Factor 2 | 1.43 | 2.71 | 0.43 | 1.04 | 1.01 | 1.32 | 3.9 |
| Eigenvalue for Factor 3 | 0.90 | 0.59 | 0.16 | 0.62 | 0.61 | 0.58 | 5.4 |
| | Factor 1 loadings | | | | | Avg. | t-ratio |
| 1. God very important in life | 0.98 | 0.93 | 0.97 | 0.95 | 0.91 | 0.95 | 82.8 |
| 2. Family should teach children faith | 0.95 | 0.91 | 0.93 | 0.94 | 0.89 | 0.92 | 95.9 |
| 3. Religion important in life | | 0.90 | 0.93 | 0.93 | 0.92 | 0.92 | 150.2 |
| 4. Better if more people are strongly religious | | | | | 0.92 | 0.92 | |
| 5. Believes in god | 0.96 | 0.80 | | 0.83 | | 0.88 | 21.5 |
| 6. Churches answer family life problems | 0.93 | 0.74 | | 0.89 | 0.89 | 0.86 | 23.8 |
| 7. Has moments of prayer and meditation | | | | | 0.84 | 0.84 | |
| 8. Attend religious service regularly | 0.88 | 0.81 | 0.89 | 0.77 | 0.84 | 0.84 | 42.2 |
| 9. Churches answer social problems | | 0.73 | | 0.92 | 0.81 | 0.82 | 18.2 |
| 10. Churches answer moral problems | 0.92 | 0.63 | 0.91 | 0.86 | 0.83 | 0.81 | 17.6 |
| 11. Non-believers are unfit for political office | | | | 0.84 | 0.71 | 0.78 | |
| 12. Are a religious person | 0.58 | 0.82 | 0.83 | 0.82 | 0.79 | 0.77 | 18.1 |
| 13. Churches answer spiritual needs | 0.86 | 0.67 | | 0.78 | 0.70 | 0.75 | 20.4 |
| 14. Belongs to religious denomination | 0.28 | 0.52 | 0.65 | 0.69 | | 0.53 | 6.7 |
| 15. Income (ln GDP per capita) | -0.31 | -0.43 | -0.50 | -0.64 | -0.69 | -0.51 | -8.3 |

Note: The factor analyses are run for the available items and income. The t-ratio given in the right hand column measures the cross-wave stability of the factor loadings. When the cross-wave stability of the loadings to factor 2 is analyzed in the same way, no t-ratio exceeds 0.7. Only the last two rows of factor loadings have a trend.

Thus, the dominant first factor is robustly negatively correlated with income. The calculations given in the right hand column in Table 1 and the bottom line in Table 2 are done quite differently. It is reassuring that the results are similar. This already suggests a strong religious transition – though it is still a measure of correlation only.

The factor analysis is based on a balanced sample within each wave, so it uses only about 80% of the data. The factor analysis has also been run on the pairwise correlations, where each correlation uses as many observations as possible. The pairwise correlation factor analysis uses more data, but it is less consistent, so it is debatable which sample to prefer in principle. However, the results are virtually the same. Also, an aggregate factor analysis has been made by joining the individual waves together in one matrix. It also gives much the same results. The same applies to the average non-diagonal correlations.

The standard method of weighting a set of correlated items is to use principal components. Parallel to Table 2, a table of principal components has been calculated. The

column of averages in this table are used as weights for the $N$ = 240 religiosity scores, $R$, reported in the online appendix. The 51 factor loadings in Table 2 have an average of 0.83 with a standard deviation of 0.13, so the aggregate is rather robust to the weights used. Finally, it should be noted that the average wave contains 10 items, so by using the averages of the items, uncorrelated measurement errors are reduced by a division with $\sqrt{10} \approx 3$.

The two variables have the transition path, $R = r(y)$, with the slope $\lambda = \partial R/\partial y$. An estimate of $\lambda \approx -11$ (as found) means that religiosity falls by 11 percentage points when income rises by one logarithmic point.

### 3.3. The changing composition of the countries in the wave

A complete panel for 95 countries and five waves would contain 475 polls, but our sample contains only 240 polls.[8] Thus, the gaps in the panel are substantial, which limits the gain from using the panel structure.[9] The regression analysis uses either the cross-country sample of 95 country averages, $\underline{R}$, or the full sample of 240 $R$s with controls for waves and selected groups of countries and religions.

Table 3. The representativity of the sample of *R*-data

| | 1982 | 1990 | 1995 | 2000 | 2005 | All | All |
|---|---|---|---|---|---|---|---|
| | Countries included: all and grouped in two ways | | | | | Polls | Countries |
| All | 21 | 43 | 54 | 70 | 52 | 240 | 95 |
| West | 17 | 20 | 10 | 21 | 14 | 82 | 27 |
| P-Com | 1 | 12 | 22 | 20 | 8 | 63 | 23 |
| Others | 3 | 11 | 22 | 29 | 30 | 95 | 45 |
| Christian | 19 | 37 | 43 | 49 | 30 | 178 | 62 |
| Muslim | | 2 | 6 | 15 | 14 | 37 | 23 |
| Others | 2 | 4 | 5 | 6 | 8 | 25 | 10 |
| | The share (in %) of the sample | | | | | Average | All [1)] |
| World Countries | 11.7 | 21.5 | 26.5 | 34.3 | 25.0 | 27.4 | 45.7 |
| World Population | 17.5 | 66.8 | 72.4 | 81.5 | 74.7 | 62.6 | 89.5 |
| | Excess income (in %) in countries of sample | | | | | Average | |
| GDP per capita | 96.0 | 59.2 | 15.2 | 20.2 | 20.5 | 42.2 | 12.8 |

1. All countries covered at least once.

[8] In addition to countries that are dropped in the polls, some items also are dropped. For 240 polls a complete coverage would demand 3,360 polled items, but we only have 2,331.
[9] The online appendix shows that the results are virtually the same using panel regressions.

The missing observations are not random.[10] The 1982 wave covered countries mainly in the *West*, which were twice as rich as the average country in the world. The next waves came to contain many *P-Com* (Post-Communist) countries to catch the effects of the collapse of Communism. As time passed, the sample changed to include more *Muslim* countries.

Consequently, each wave of the WVS has a fairly skewed sample of countries relative to the true distribution of countries in the world. The cross-wave stability of the *R*-factor is therefore quite remarkable. Representativity is better once all waves are taken together. The last column of Table 3 reveals that the 95 countries included in at least one poll hold almost 90% of the world population and are only 13% richer than the average of all countries.[11]

## 4. The long-run causality between income and religiosity: A test

The GT-framework from section 2.1 deals with the long-run relation $R = R(y)$, where it has to be show that (T1) $y$ is causal to $R$. To this end the long-run causality test developed in Gundlach and Paldam (2009a) is applied. We know from other fields that clear long-run results may hide more complex short-run interactions.

### 4.1. The DP-variables used as instruments in the long-run causality test

To estimate the causal effect of income on a transition variable, a set of instrumental variables is needed. In the part of Europe where both authors live, the dominating religion has changed twice in the recorded history of the last dozen centuries. Religion similarly has been stable in most parts of the world. This suggests that religiosity may also change slowly. In order to find variables that can explain the cross-country pattern in the $y$-variable independently of the $R$-pattern, instruments are needed that measure the *development potential* (DP) of countries well before the main religions originated. Our DP-variables are inspired by Diamond (1997) and most have been compiled by Olsson and Hibbs (2005); see also the online appendix.

The DP-variables give *biogeographical* conditions prevailing in the regions of present-day countries at the time of the Neolithic Revolution. The *biological* variables are counts of the number of domesticable animals and arable plants in various regions in those distant times. The *geographical* variables cover the more or less fortunate location of

[10] The changing composition of the country sample probably reflects public concerns at the time of the wave. It is difficult to fund such a large project as the *WVS*, and funding possibilities depend on the public interest

[11] The effects of the changing sample were analyzed by fixed effects for waves, and the online appendix shows that the effects are surprisingly small.

countries as regards agricultural production and exchanges of goods and ideas.

It is surprising that these variables work, but they prove sufficiently correlated with present levels of prosperity to pass statistical tests for instrument strength.

4.2. The OLS- and IV-estimates in the long-run causality test

The DP-instruments are available as cross-country data sets with 59 to 85 observations which can be merged with the cross-country data set for religiosity $\underline{R}_i$ with 95 observations. The income variable, $\underline{y}_i$, is averaged in the same way as the *R*-score. The two estimates are:

(1) $\underline{R}_i = \alpha + \lambda_{OLS}\underline{y}_i + \varepsilon_i$, *base model*, *i* is an index for countries. The residuals are $\varepsilon$.

(2) $\underline{R}_i = \alpha + \lambda_{IV}\underline{y}_i^{IV} + \nu_i$, which is a second-stage estimate. The first-stage instruments income $\underline{y}$ with the DP-variables. The residuals are $\nu$.

The test of the main direction of causality between religiosity and income compares estimates of the transition slopes, $\lambda_{\mathrm{OLS}}$ and $\lambda_{\mathrm{IV}}$, for different combinations of the DP-instruments. The results are reported in Table 4.

The first section of the table reports the OLS-estimates, which confirm the negative long-run correlation of income and religiosity found in section 3. The suggested order of magnitude of the transition slope is $\lambda_{\mathrm{OLS}} \approx -12$.

Next, the validity of the IV-estimates has to be considered: The first-stage $R^2$ is high for all instrument combinations, columns (1) to (5); the Sargan test reveals that the instruments are valid and correctly excluded from the estimation equation in three out of five cases; the Cragg-Donald (CD) test statistics are above or at the critical value – the instruments are thus reasonably strong. Hence, the IV-results are statistically valid and identify the *causal* effect of income on religiosity.

All five IV-estimates of the slope are highly significant and rather similar: $\lambda_{\mathrm{IV}} \approx -14$. Our favorite combination of instruments is in column (1). It uses the principal components of the geographical variables and the biological variables as the two DP-variables, but statistically the test results are better in column (2).

It looks as if $\lambda_{\mathrm{OLS}} < \lambda_{\mathrm{IV}}$. This is formally tested by the Hausman C-test, which rejects the difference in three cases and accepts it in two.[12] We conclude that the simultaneity bias in

[12] The approximate equality of the estimates rejects an endogeneity bias in the OLS-estimate. Normally the DP-instruments show causality one way only, but exceptions may occur; see Gundlach and Paldam (2011).

the OLS-estimate of $\lambda$ is small and of a dubious significance.

Table 4. Two estimates of the long-run slope $\lambda$ of the religious transition

| Average data for 1982-2005 | Main model | Robustness of model to instrument variation | | | |
|---|---|---|---|---|---|
| Dependent variable: $\underline{R}_i$ | (1) | (2) | (3) | (4) | (5) |
| No. of countries | 59 | 64 | 59 | 59 | 85 |
| | | | OLS estimates | | |
| Transition slope $\lambda_{OLS}$ | **-12.34** | **-11.79** | **-12.34** | **-12.34** | **-11.01** |
| (t-ratio) | (-7.5) | (-7.5) | (-7.5) | (-7.5) | (-6.5) |
| Centered $R^2$ | 0.49 | 0.48 | 0.49 | 0.49 | 0.36 |
| | | | Causality: $\underline{y} \Rightarrow \underline{R}$ : IV estimates: $y$ is instrumented | | |
| Transition slope $\lambda_{IV}$ | **-14.99** | **-15.63** | **-14.62** | **-12.82** | **-15.53** |
| (t-ratio) | (-5.7) | (-6.8) | (-5.6) | (-5.6) | (-6.6) |
| Instruments | *biofpc, geofpc* | *bioavg, geoav* | *animals, plants* | *axis, size, climate* | *coast, frost, maleco* |
| | | | Hausman test for parameter consistency of OLS and IV estimate | | |
| C-statistic (p-value) | 0.18 | 0.01(!) | 0.25 | 0.76 | 0.00(!) |
| | | | Tests of validity of the IV-procedure | | |
| First stage partial $R^2$ | 0.41 | 0.52 | 0.41 | 0.53 | 0.49 |
| Sargan test (p-value) | 0.05(!) | 0.92 | 0.17 | 0.43 | 0.04(!) |
| | | | Cragg-Donald test for weak instruments | | |
| CD-test for $\underline{y} \Rightarrow \underline{R}$ | 19.42(?) | 32.57 | 19.72(?) | 20.38(?) | 26.28 |
| CD critical value | 19.93 | 19.93 | 19.93 | 22.30 | 22.30 |
| | | | Control check for reverse causality | | |
| CD-test for $\underline{R} \Rightarrow \underline{y}$ | 13.79 | 22.45(?) | 11.94 | 7.51 | 18.75 |
| C-statistic (p-value) | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |

Notes: t-ratios are in parentheses. Bolded coefficient estimates are statistically significant at the 5% level. A (!) indicates a problematic result, (?) indicates a borderline result. The sample used in column (2) includes measures of biogeography for the Western offsprings Australia, Canada, New Zealand, and the United States (and Germany), which are coded as European countries. All specifications include an unreported constant term. A Cragg-Donald (CD) statistic *below* the critical value (10% maximal test size) indicates weak instruments. The Sargan test for overidentification tests the joint null that the instruments are valid and correctly excluded from the estimated equation.

This is further checked in the last section of Table 4 (shaded), where DP-variables instrument religiosity that is used to explain income, $\underline{R} \Rightarrow \underline{y}$, Only the results of the CD-test and the Hausman C-test are reported. The CD-test statistics are smaller than in the corresponding regression for the main causal direction in all cases and larger than the critical value in one case only. The Hausman C-statistic shows that the difference in the coefficients on $R$ is statistically significant. This confirms that our instruments show causality from income to religiosity, but not the other way around.

The online appendix reports robustness checks of the estimates of Table 4 by

including a set of controls for major religions and political systems. The estimated transition slope remains unaffected by the inclusion of controls (see also next section), as should be the case in the presence of valid instruments.

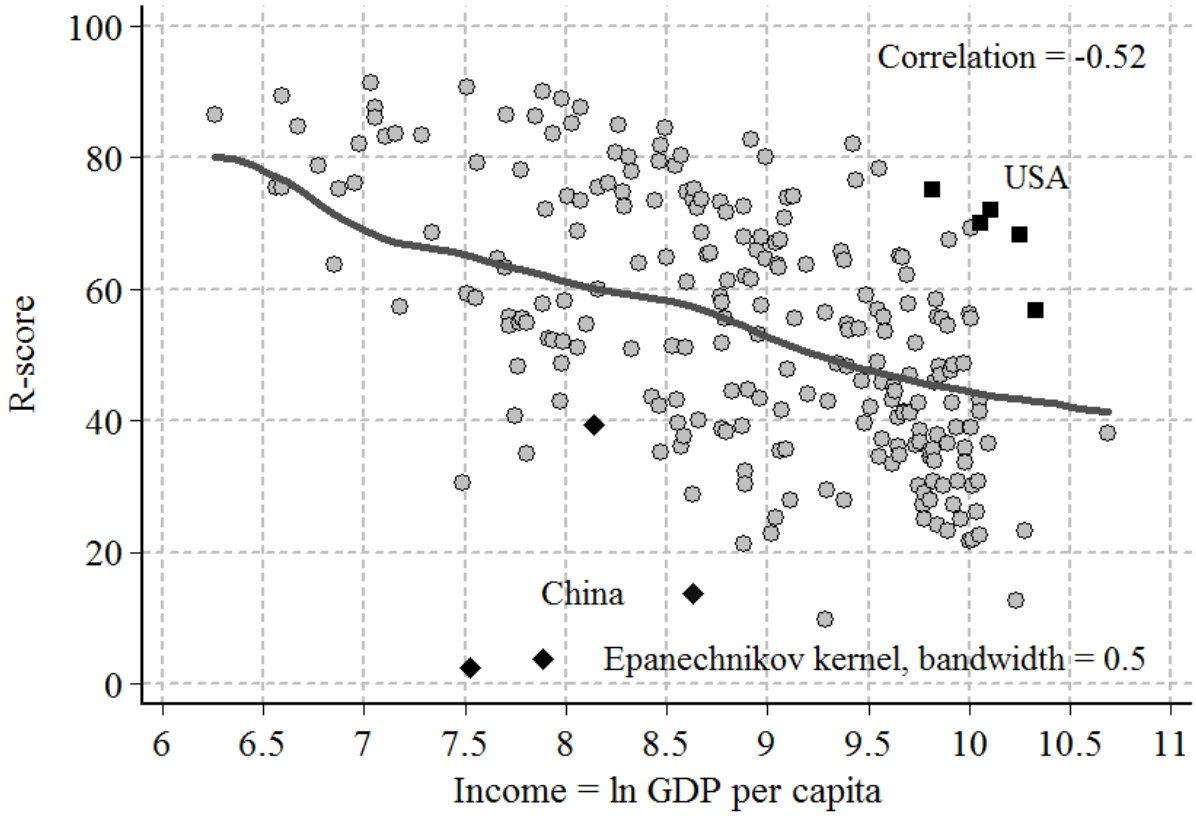
## 5. The size and robustness of the transition slope $\lambda$

Section 4 gave IV-estimates of the transition slope, $\lambda$, that are in the range of -12 to -16. They were based on averages across waves for the countries where the DP-instruments are available. This resulted in a significantly smaller sample. However, once the causality issue is settled it is possible to use all data for a more detailed and precise analysis.

### 5.1 A scatter plot of religiosity, *R*, over income, *y*

Figure 2 shows the (*R*, *y*)-relation based on all 240 data points. The graph includes a kernel-curve which represents a local polynomial smoothing of the data points with a fixed bandwidth. It shows that a (log) linear approximation is appropriate.

Figure 2. Religiosity explained by income, $N$ = 240 polls



The WVS covers relatively few countries near the traditional level in the bottom income percentile. These countries have *R*s of about 80 percentage points, and the measure of *R* can hardly be higher than 90%, so the traditional level $R^T \approx 80\ \%$ is well determined. The decline in the curve and hence the adjustment path is obvious, but the modern equilibrium level $R^M$ is not well determined in the highest income percentile. It is clear that the modern level is below 40%, but stability has not yet been reached. Perhaps the decline has slowed down, so perhaps it will cease, but it is difficult to predict whether it will stabilize at 30% or continue to fall.

The data points are considerably scattered around the average curve, so the religious transition explains only some of the observed variation. China and the United States are depicted in black on Figure 2, since Section 5.3 below points to these countries as the most extreme ones. They are outliers reflecting inertia in religiosity. A more detailed study of the cross-wave observations for each country shows that they are often quite similar relative to the general trend, indicating path dependency.

All $N = 240$ observations on Figure 2 have the coefficient of correlation, $r = -0.52$, and the N = 124 Christian countries, $r = -0.70$ (see the online appendixs for the scatter diagram). A strict division into three main groups also gives stable correlations. For the $N = 82$ observations for the *West*, $r = -0.48$; for the $N = 63$ observations for *P-Com*, $r = -0.53$; and for the $N = 95$ observations for *Others*, $r = -0.47$. The same picture of stability will turn up in the multilateral regressions below.

## 5.2. Changes of religiosity over time, for ΔM = 906 polled item changes[13]

The analysis of the trends over time is based on first differences across waves. But using first differences of the religiosity score would reduce the sample size by too much. Hence, we use the larger sample of $M = 2{,}331$ polled items, where each of the items is taken as a proxy for the aggregated R-score. This sample gives $\Delta M = 906$ observations on item changes which are defined as $\Delta_{ijt} = R_{ijt} - R_{ijt-1}$ where *i* is country, *j* is item, and *t* is wave.

Table 5 reports the results for item changes. A negative trend is expected according to Table 4 and Figure 2, but the average of all 906 changes $\Delta_{ijt} = R_{ijt} - R_{ijt-1}$ is 0.34 which is statistically insignificant with a t-ratio of 1.1. Hence, there is no statistically significant trend. But if the overrepresented Post-Communist (P-Com) countries are excluded, $N = 625$ observations remain and the average cross-wave change of the religiosity items is -1.0 with a

[13] The online appendix reports a related analysis of the within-country slope.

t-ratio of -2.8. A change of -1 percentage points per five-year period is precisely as predicted from Table 4.

Table 5. Changes in religiosity items across waves, 1982-2005

| | Difference | 1982-90 | 1990-95 | 1995-00 | 2000-05 | All |
|---|---|---|---|---|---|---|
| | | | Part A: Aggregate results | | | |
| All countries | Average | ***-1.47*** | **2.88** | **1.13** | ***-0.93*** | 0.34 |
| | t-ratio, N | -1.7, 153 | 4.3, 184 | 2.5, 259 | -1.7, 310 | 1.1, 906 |
| Except P-Com | Average | ***-1.43*** | -0.02 | 0.38 | **-1.97** | **-1.01** |
| | t-ratio | -1.8, 148 | -0.0, 112 | 0.7, 130 | -3.1, 235 | -2.8, 625 |
| | | | Part B: Divided in 3 groups | | | |
| West | Average | **-1.60** | -0.78 | -0.64 | -0.99 | **-1.18** |
| | t-ratio | -2.2, 133 | -0.9, 50 | -0.8, 37 | -1.2, 75 | -2.8, 295 |
| P-Com | Average | -2.64 | **7.40** | **1.88** | **2.36** | **3.34** |
| | t-ratio | -0.3, 5 | 6.4, 72 | 2.8, 129 | 2.9, 75 | 6.3, 281 |
| Others | Average | 0.04 | 0.59 | 0.79 | **-2.44** | -0.85 |
| | t-ratio, N | 0.0, 15 | 0.6, 62 | 1.1, 93 | -2.8, 160 | -1.5, 330 |
| | | | Part C: Parts of Others | | | |
| Muslim excl. P-Com | Average | | ***4.69*** | -1.71 | -1.82 | -1.44 |
| | t-ratio | | 1.7, 5 | -0.8, 18 | -1.3, 68 | -1.2, 91 |
| Latin American | Average | 3.96 | 1.19 | 1.92 | **-8.04** | ***-1.48*** |
| | t-ratio, N | 2.1, 6 | 0.9, 29 | 1.7, 43 | -8.7, 39 | -1.9, 117 |

Note: Averages in bold are significant at the 5% level. Averages in bold and italic are significant at the 10% level. The table uses all available observations on item changes; $\Delta M$ = 906 item changes. The gray cells are based on one country only. The first observation in the P-Com row refers to a date before the fall of Communism. The country classification is given in the online appendix.

The average changes in the religiosity items for the *West* are significantly negative, and the decline is -1.2 percentage points, on average, per wave (i.e., over five years). The decline gradually slows, suggesting that the transition may converge to a stable level. For *Others* the fall is similar in size, but more erratic. It is often alleged that religiosity has increased in the Muslim world in the last quarter century, but this is not confirmed. Table 6 below shows that Muslim countries do have a relatively high level of religiosity relative to their income level, but it declines just as in other countries. The Latin American countries also have large declines in religiosity items in 2000-2005. Religiosity falls by about -1.5 percentage points per wave in both of these country groups, just as predicted from all countries based on Table 4. However, the *P-Com* countries have a significant rise in religiosity items by 11.6 percentage points from 1990 to 2005.

The P-Com countries are the major exception to the general pattern. Our interpretation is that the suppression of religiosity has ceased with the fall of Communism, and so religiosity

is returning to a normal level conditioned by the level of income. This interpretation implies that the suppression of religiosity by the Communist regimes was successful temporarily, as will be further discussed in section 5.5 and in the online appendix.

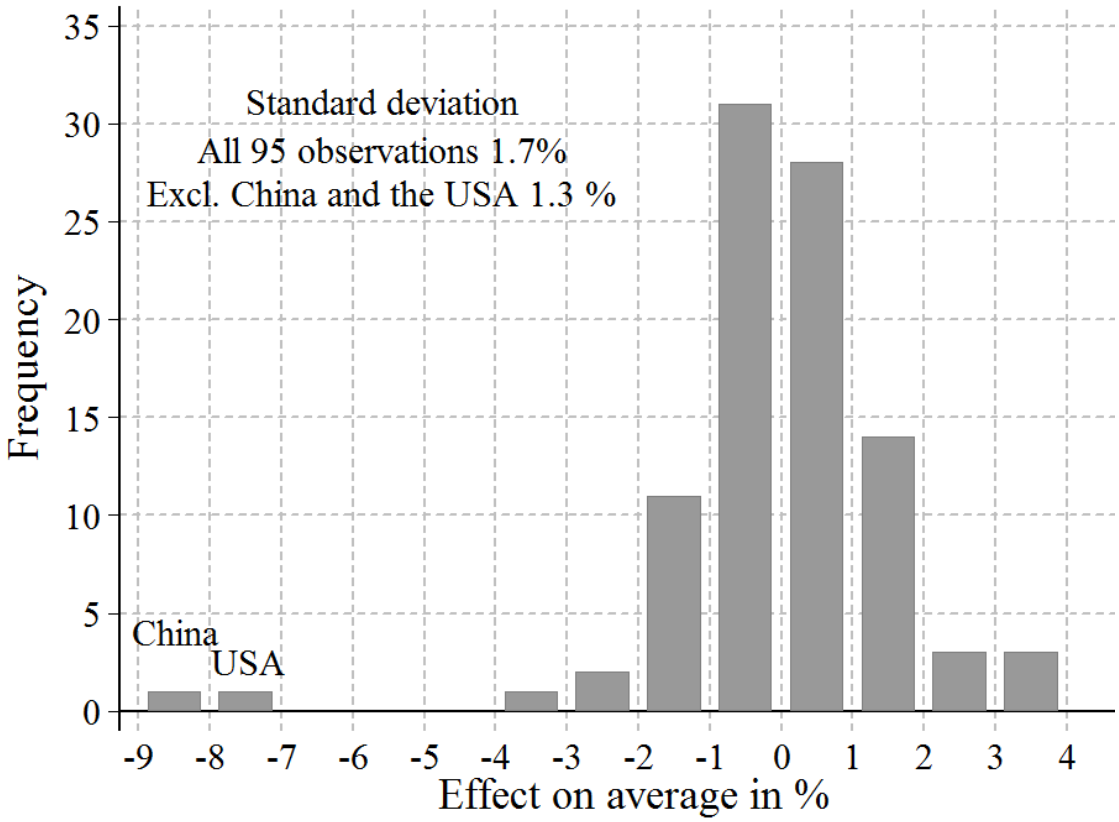
5.3. The robustness of λ to the deletion of outliers and suspicious countries

The 240 polls have one to five polls for each country. The base model (1) becomes:

(3) $R_j = \alpha + \lambda y_j + \mu_j$, for $j$ = 1,…, 240 and $\mu$ are the residuals.

The base regression with all 240 observations gives the estimate $\lambda_{all}$. It is possible that the size of the estimated $\lambda$ hinges upon the inclusion of one or a few outliers. Therefore, 95 estimates, $\lambda_1, \ldots, \lambda_{95}$, are generated, where $\lambda_i$ is estimated on the sample after excluding the observations for country $i$. These estimates differ from $\lambda_{all}$ by the percentage effect $\eta = 100 \cdot (\lambda_i / \lambda_{all} - 1)$. Figure 3 shows the distribution of the 95 effects.

Figure 3. The effect on $\lambda$ of the deletion of one country from the sample



Except for the two outliers – China and the United States – the distribution of the $\eta$s is nicely normal with a rather small standard deviation. For more than half of the 95 countries $-1 < \eta < 1$. This means that if there is some measurement error in the data for one country, this normally influences the estimate of $\lambda$ by less than one percent. The estimated $\eta$s are approximately additive, so that the effect of deleting two countries is the sum of the effect of the deletion of each. Table 5 in the online appendix shows that even with deleting up to 8-10 countries, summing up the single country-effects still gives a rather good approximation.

The effect of deletion a country altogether places an upper bound on the effect of a possible measurement error in the polls for the country. The true effect of a measurement error affecting the data of the country is likely to be (much) smaller.

The two outliers have $\eta$s of about −8%. As seen in Figure 2, China is (still) a relatively poor country with low religiosity, and the United States is a rich country with high religiosity, so their effects on the estimate of $\lambda$ are much the same. The exclusion of each country increases the numerical size of the parameter by 8%. If the two outliers are both deleted the estimated transition becomes 16% faster, so that $\lambda$ changes from -10.8 to -12.6.

Religiosity polls for some countries are *suspicious*. This applies to polls under anti-religious authoritarian regimes, such as China and Vietnam, but note that the poll from Hong Kong is not much different from the one from China. In the same way polls from authoritarian religious regimes such as Iran and Saudi Arabia, may be suspected. If the two countries are excluded the effect is to change the estimated transition slope by +0.5%. If all 17 polls from the nine Middle Eastern and North African countries are deleted the effect is +6.8%, which is numerically less than the effect (−8.2%) of deleting the five polls from the United States.

A number of such experiments are reported in the online appendix. While some polls may have reporting skewnesses, we believe to have demonstrated that this can have only a minor effect on the main pattern found.

### 5.4. The robustness of $\lambda$ to religions and country groups

The robustness of the transition slope $\lambda$ is also checked by including binary dummies for the main country groups and religions. The dummies should be self-explanatory, and they are also defined in the online appendix. The results are reported in the three parts of Table 6. Part A is the point of reference using the base model (3) for the full sample with 240 polls.

Table 6. The effects of income and different cultures on religiosity, $N = 240$ polls

| Dependent variable: $R$ | Part A Base | Part B Average of 10 estimates | | Part C Regressions with all (significant) groups | | | |
|---|---|---|---|---|---|---|---|
| $N = 240$ | (1) | (2) | (3) | (4a) | (4b) | (5a) | (5b) |
| λ on income | **-10.82** | | **-10.72** | | | **-11.51** | **-11.33** |
| (t-ratio) | (-9.4) | | (-9.1, -7.8) | | | (-9.0) | (-11.4) |
| Constant | **150.14** | **53.66** | **148.82** | **67.29** | **67.82** | **158.91** | **157.94** |
| (t-ratio) | (14.5) | (40.9, 18.5) | (14.1, 11.1) | (25.6) | (36.6) | (15.2) | (17.2) |
| | None | One group in each estimate | | All (significant) groups included | | | |
| West | | **-11.11** | ***5.75*** | **-19.18** | **-19.51** | 0.88 | |
| (t-ratio) | | (-4.3) | (1.9) | (-6.0) | (-7.6) | (0.3) | |
| P-Com | | **-8.55** | **-14.42** | **-20.38** | **-19.71** | **-13.61** | **-14.29** |
| (t-ratio) | | (-3.0) | (-6.2) | (-6.7) | (-7.6) | (-5.0) | (-7.1) |
| Others | | **17.24** | **10.08** | | Deleted when West and | | |
| (t-ratio) | | (7.4) | (4.2) | | P-Com are included | | |
| East Asian | | **-17.24** | **-16.76** | **-24.30** | **-24.86** | **-11.50** | **-12.34** |
| (t-ratio) | | (-3.9) | (-4.7) | (-6.0) | (-6.8) | (-3.0) | (-4.0) |
| Lat. Am. | | **16.03** | **15.35** | 0.96 | | **10.93** | **10.28** |
| (t-ratio | | (4.2) | (4.7) | (0.3) | | (3.2) | (3.9) |
| Muslim | | **24.40** | **16.10** | **12.89** | **13.14** | **9.84** | **11.24** |
| (t-ratio) | | (7.3) | (4.7) | (3.5) | (4.4) | (3.1) | (4.2) |
| Arab | | **29.30** | **19.76** | 1.92 | | 5.02 | |
| (t-ratio) | | (7.3) | (3.7) | (0.4) | | (1.1) | |
| Scandinavian | | **-19.54** | **-9.19** | **-12.15** | **-12.15** | **-10.65** | **-10.60** |
| (t-ratio) | | (-4.2) | (-2.2) | (-3.3) | (-3.3) | (-3.3) | (-3.4) |
| China | | **-39.90** | **-49.83** | **-28.20** | **-28.17** | **-40.05** | **-39.71** |
| (t-ratio) | | (-4.2) | (-6.3) | (-3.7) | (-3.7) | (-5.9) | (-5.9) |
| United States | | ***14.80*** | **29.41** | **20.41** | **20.41** | **24.17** | **25.06** |
| (t-ratio) | | (1.7) | (3.9) | (3.2) | (3.2) | (4.4) | (4.5) |
| $AR^2$ | 0.267 | | | 0.494 | 0.498 | 0.624 | 0.626 |

Note: Pooled OLS estimation, t-ratios are in parentheses. A second t-ratio (upper panel) indicates the cross-estimate stability. Bolded estimates are significant at the 5% level; coefficients that are bolded and in italics are significant at the 10% level. The overlapping of the dummies is explained in the online appendix.

Part B reports results for ten independent regressions of religiosity on a constant and *one* of the country (group) dummies. Income is excluded in column (2) and included in column (3). The results for the base model in Part A are the averages of the ten estimates. Here the first t-ratio is the average from the ten regressions, and the second t-ratio indicates the cross-estimate stability of the ten regressions.

Part C gives the results of two pairs of regressions. Columns (4a) and (5a) include *all* country dummies, without and with income. The corresponding columns (4b) and (5b) give the tested-down versions from which the least significant country dummies have been excluded, one at a time, till only significant variables remain in the reported specification.

Parts B and C show that most country dummies are statistically significant. When they are jointly included, the fit ($R^2$) is improved from 0.267 to 0.626, but this barely affects the estimate of $\lambda$. The top row of estimates in the table shows that $\lambda \approx -11$. This is in line with the results of Table 4 and the "within"-result of Table 5. Thus, our estimate of $\lambda$ is robust to the many controls tried, just as in section 5.3. A further set of regressions in the online appendix shows that the estimate of $\lambda$ is also robust to variables for political regime types and the main religions.

### 5.5. Detour: Stories of the estimated coefficients on the country dummies

It is worth leaving the main story for a brief detour and look at the coefficients on some of the country groups in Table 6.

The *West* changes sign from negative significant to positive insignificant when income is held constant. The West is relatively rich, so these estimates say that *all* of the low religiosity of the West can be explained by the rise in income. The United States is marginally more religious than the average of all countries, so it is a very religious country when its religiosity level is adjusted for income. The Scandinavian countries have unusually low levels of religiosity. They have almost the same level of income as the United States, but about 35 percentage points less religiosity.

The East Asian group is less religious than other countries. China is extreme when unadjusted, and even more so when adjusted for income.

The Muslim countries are relatively religious, but only by 10 to 11 percentage points when income is entered. The Arab countries are marginally more religious than other Muslim countries, but the difference is insignificant.[14] If the Muslim countries became as rich as the West, they would be less religious than the United States by our estimates.

The *P-Com* countries are relatively less religious by about 14 percentage points when controlled for income. Only one of these countries (Hungary) was covered by the WVS when they were Communist before 1990. Table 5 showed that religiosity increased by about 11.6 percentage points in these countries between 1990 and 2005. Thus, some part of the 11.6 percentage points should be added to 14 percentage points. From several standard calculations we assess that religiosity in the Communist period was about 20 percentage points lower than in other countries at comparable levels of income; see also the online appendix.

[14] The dummy variable for the Arab countries is additional to the dummy variable for the Muslim countries.

## 6. Demand and supply

The purpose of section 6 is to show that the religious transition can be explained both from the demand and the supply side. Also, we want to get some intuition as to the modern level, $R^M$, which may keep falling before converging to a steady level.

### 6.1. The demand side

Religion is demanded to give divine protection against risks to life and property. The GT doubles the expected life span from about 40 to 80 years. It also allows people to save for pensions and insurance, public transfers appear, etc. All this reduces the risk or its effects. Accordingly, the need for divine protection falls, and so does the demand for religion.[15]

Religion is demanded to provide explanations of the unknown. Here science has become an alternative. It is no wonder that many churches have fought to uphold religious explanations against the onslaught of scientific explanations. However, science has made substantial progress in reducing the unknown. In the post-transition world people have largely ceased to associate diseases with evil spirits and magic spells.

It is obvious that these components will level off so that there may be convergence, but it is difficult to predict a steady state level. The same considerations do not apply to the demand for religion as a consumption good. It is likely that the consumption component of religion may have some irreducible level well above zero. Our empirical findings show that the irreducible level of religiosity has not yet been reached.

### 6.2. The supply side: The loss-of-channels theory[16]

Churches supply religious goods directly by religious services, and in the form of high-quality ceremonies for the rites of passage between the stages in life: birth, maturity, marriage, and death. Religious goods have also been supplied as a *joint product* with education, social security, and healthcare.

The GT has changed the size and the ownership of the production of the three collective goods. Their share in GDP has increased from about 5-10% to about 30-40%, and

[15] The demand for divine protection against an event $e$ is proportional to $\rho \cdot W$, where $\rho(e)$ is the risk that the event occurs and $W(e)$ is the welfare cost of the event if it occurs. If $W(e)$ is constant, the conclusion is as stated in the text, but if $W(e) = f(1-e)$, i.e., welfare is a function of non-occurrence, the conclusion no longer holds.

[16] The argument in this section is inspired by Puchades-Navarro and Montoro (2009).

the control of production moved from the church to the state.[17] When a secular state took over, it used the provision of collective goods to supply its own secular ideology.

Churches lost control over the three channels by a self-reinforcing mechanism. In poor societies, the tax base is small and most tax revenue is used to finance the power structure holding the state together against internal and external enemies. Churches did only have the power to tax in cooperation with the state,[18] but they collected a great deal in alms, which were used to pay for the production of the religious goods and to provide a minimum level of the three collective goods.

When economic development caused an expansion of education, and rising incomes allowed better healthcare and social security, the costs of these services became too large to be financed by alms. At the same time, the state developed an ever greater ability to tax, and hereby it gained control over the provision of the three collective goods. This in turn undermined the ability of churches to collect alms. The result was a dynamic take-over of the three channels by the state. We consider this a powerful mechanism in the religious transition.[19]

## 7. Conclusion: A clear transition

The religious transition is the decline of religiosity caused by rising levels of development. Using a new composite index of religiosity *R*, the paper estimates the path of the transition and explains the underlying mechanisms.

The transition causes *R* to fall from about 80% to about 40%. The transition is still not complete in the developed countries, although it has slowed down. It will probably continue to reach 30% or go even lower. The estimated slope of the transition, $\lambda \approx -11$, proved rather robust. The full transition normally takes one to two centuries, so the change per year is only 0.2-0.5 percentage points, which gives 1-2 percentage points over the five years between WVS-waves. Hence, the religious transition is easy to overlook in the perspective of five to ten years, especially as religiosity data vary considerably across countries.

To establish the micro foundations of a macro regularity is notoriously difficult. We

[17] In most countries these sectors also have private firms. They will be disregarded in the interest of brevity. In passing, we note that the take-over by the state has been less complete in the United States than in other developed countries. This may contribute to the high religiosity in the United States.
[18] Such cooperation did happen, but often Church and State competed for power, see Eklund *et al.* (2005).
[19] The transition of religious institutions (churches) from being a net provider of collective goods to becoming a net recipient of subsidies is paralleled by the transition of the agricultural sector from being a contributor of taxes to also becoming a recipient of subsidies (see Krueger 1996).

argue that when income rises the demand for religion as a factor of production may converge to zero in the limit, while the demand for religion as a consumption good may converge to a level well above zero. The loss control by religious institutions over the provision of collective goods also appears to be a powerful mechanism in the religious transition.[20]

We conclude that the religious transition is a substantial phenomenon that has general explanations even if many details of these explanations differ across countries, and, without doubt, also between the religions.

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[20] For a modeling of the substitution effects on the demand side and the supply side away from religion and towards science, see Gundlach and Paldam (2012).

## References


Azzi, C., Ehrenberg, R., 1975. Household allocation of time and church attendance. *The Journal of Political Economy* 83, 27-56

Bjørnskov, C., Paldam, M., 2012. The spirits of capitalism and socialism. A cross-country study of ideology. *Public Choice* 150, 469–98

Diamond, J., 1997. *Guns, germs, and steel: The fates of human societies*. Norton, New York

Durkin, J.T., Greely, A.M., 1991. A model of religious choice under uncertainty: On responding rationally to the nonrational. *Rationality and Society* 3, 178-96

Ekelund, R. B. Hébert, R. F., Tollison, R. D., 2006**.** *Marketplace of Christianity***.** MIT Press, Cambridge, MA

Finke, R., Iannaccone, L.R., 1993. Supply-side explanations for religious change. *Annals of the American Academy of Political and Social Science*, Vol. 527 May, 27-39

Gundlach, E., Paldam, M., 2009a. A farewell to critical junctures: Sorting out long-run causality of income and democracy. *European Journal of Political Economy* 25, 340-54

Gundlach, E., Paldam, M., 2009b. The transition of corruption. From poverty to honesty. *Economic Letters* 103, 146-48

Gundlach, E., Paldam, M., 2010. The agricultural, demographic and democratic transitions. Two estimation models giving reverse results. Latest version available from http://www.martin.paldam.dk

Gundlach, E., Paldam, M., 2012. An endogenous growth model of the religious transition. P.t. working paper. Posted on our home pages

Higgins, B., 1959. *Economic development. Principles, problems, and policies*. Constable and Co., London

Iannaccone, L.R., 1998. Introduction to the economics of religion. *Journal of Economic Literature* 36, 1465-95

Inglehart, R., Basáñez, M., Díez-Medrano, J, Halman, L., Luijks, R., eds. 2004. *Human beliefs and values. A cross-cultural sourcebook based on the 1999-2002 value surveys*. Siglo XXI Editiones, México, D.F.

Inglehart, R., Basáñez, M., Moreno, A., eds. 1998. *Human values and beliefs. A cross-cultural sourcebook*. University of Michigan Press, Ann Arbor, M.I. See also WVS home page

Krueger, A.O., 1996. Political economy of agricultural policy. *Public Choice* 87, 163-75

Lipford, J., McCormick, R. E., Tollison, R. D., 1993. Preaching matters. *Journal of Economic Behavior & Organization* 21, 235-50.

Maddison, A., 2003. *The world economy: Historical statistics.* OECD. Paris. See also Maddison home page: http://www.ggdc.net/maddison/ gives updates of Maddison (2003)

McCleary, R.M., Barro R.J., 2006. Religion and economy. *Journal of Economic Perspectives* 20, 49-72

Olsson, O., Hibbs D.A.Jr., 2005. Biogeography and long-run economic development. *European Economic Review* 49, 909-38

Opfinger, M., 2011. Religious Market Theory vs. Secularization: The Role of Religious Diversity Revisited. Department of Economics. Working paper, Leibniz University, Hannover

Paldam, M., 2009. The integration of religion and political power. An essay on the Muslim Gap. Chapter 10, 213-42 in Wintrobe, R., Ferrero, M., eds. *The political economy of theocracy*. Palgrave, New York

Paldam, M., Gundlach, E., 2008. Two views on institutions and development: The grand transition vs the primacy of institutions. *Kyklos* 61, 65-100

Paldam, M., Gundlach, E., 2012. Online appendix to: The religious transition. A long-run perspective. Posted on our home pages

Puchades-Navarro, M., Montoro, J.D., 2009. Religious decline and public expenditure. Presented at the European Public Choice Society Meeting, Athens

Stark, R., Iannaccone, L.R., 1994. A supply-side reinterpretation of the "secularization" of Europe. *Journal for the Scientific Study of Religion* 33, 230-52

WDI, URL: http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=2

Weber, M., 1904/05. Die protestantische Ethik und der „Geist" des Kapitalismus. *Archiv für Sozialwissenschaft und Sozialpolitik* 20, 1-54 and 21, 1-110. Reprints and translations

WVS, World Values Survey, URL: http://www.worldvaluessurvey.org