

# Religion and Innovation

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American Economic Review P&P (2015)



# Introduction

- Economics and religion: complex social phenomenon:
  - ▶ Unlikely to have unambiguous effects on growth and welfare
  - ▶ More likely: relates via numerous channels, generating **tradeoffs**
- Two main mechanisms emphasized in economics literature so far, both with generally positive effects:
  - ▶ Literacy and education (historically)
  - ▶ **Morals, social norms, trust (empirics, theory)**
- Guiso, Sapienza, Zingales (2003). **WVS**: more religious people report:
  - ▶ **More trusting**: of others, public institutions, market outcomes
  - ▶ **More trustworthy**: less willing to break law, accept bribe, cheat on taxes
- Experimental evidence: some (e.g., Shariff and Norenzayan 2007)
- Theoretical models (e.g. Bénabou-Tirole 2006, 2011)
  - ▶ Beliefs in divine rewards / punishments (or “Calvinistic” self-signaling)  
⇒ individuals behave less opportunistically, more cooperatively

# Introduction

- Religiosity thus said to be associated to “societal attitudes... conducive to higher productivity and growth.” (Guiso et al.)
- However: ultimate driver of long-run-growth is progress of knowledge and technology – more generally, whole spectrum of innovation:
  - ▶ From advances in basic science to the diffusion of new technologies, economic practices, even social change (e.g., inclusion of women) ⇒
- Equally important: examine extent to which **religious beliefs, values, institutions** conducive or detrimental to **creativity & innovation**
- Revisiting age-old theme: religion's periodically tense relationship with science, unorthodox / disruptive ideas, free thought:
  - ▶ Forbidden fruit of knowledge
- Pursue this agenda through theory + empirical work, using both aggregate & individual level-data.

# Two Related Papers

1. "Forbidden Fruits": interplay of science, religion, politics
  - ▶ Historical and contemporary examples
  - ▶ Empirics: religiosity and innovation outcomes (patents) at the aggregate (political-unit) level
  - ▶ Model: joint dynamics of religious beliefs and scientific-economic development. Shaped by (and feeds back on) political conflicts and coalition formation, along religious & income lines
2. "Religion and Innovation": Individual attitudes toward innovation
  - ▶ Science & technology, new/old ideas, general change, personal risk-taking / aversion, imagination...
  - ▶ Using 5 waves of WVS, relate 11 measures of individual "openness to innovation" to 5 measures of religiosity + controls

## “Religion and Innovation”: Individual-Level Analysis:

- World Values Survey: 1980, 1990, 1995, 2000, 2005
- Religiosity:
  - ▶ *Religious Person*
  - ▶ *Belief in God,*
  - ▶ *Importance of Religion in your life*
  - ▶ *Importance of God in your life*
  - ▶ *Religious Attendance*
- Controls:
  - ▶ *Age, Gender, Social Class, Education, Income*
  - ▶ Religion-specific dummies (almost 90). Aggregate later on
  - ▶ Dummies for town size, country, year

# “Religion and Innovation”

## A. Attitudes toward science and technology

- ① *“We depend too much on science and not enough on faith”*
- ② *“Science and technology make our way of life change too fast”*
- ③ *“The world is better off because of science and technology”*

## B. Attitudes toward new ideas, change, and risk-taking

- ① *Which are better: “Ideas that stood the test of time”, vs. “New ideas”*
- ② *Self-recognition in “It is important to this person to think up new ideas and be creative; to do things one’s own way”*
- ③ *“I worry about difficulties changes may cause”, vs. “I welcome possibilities that something new is beginning”*
- ④ *Self-recognition in “Adventure and taking risks are important to this person; to have an exciting life”*
- ⑤ *Everything is determined by fate”, vs. “People shape their fate themselves”*

## “Religion and Innovation”

**C. Child qualities** Among 11 “*Qualities that children can be encouraged to learn at home,*” respondents pick the 5 they consider “especially important”. Select three most directly related to our inquiry:

- ① *Imagination*
- ② *Independence*
- ③ *Determination and Perseverance*

Table 1: Attitudes Toward Science and Technology

	(1) <i>Too much dep. on science vs faith: disagree (E220m)</i>	(2) <i>Too much dep. on science vs faith: disagree (E220m)</i>	(3) <i>Too much dep. on science vs faith: disagree (E220m)</i>	(4) <i>Too much dep. on science vs faith: disagree (E220m)</i>	(5) <i>Science &amp; Tech. life change too fast: disagree (E219m)</i>	(6) <i>Science &amp; Tech. life change too fast: disagree (E219m)</i>	(7) <i>Science &amp; Tech. life change too fast: disagree (E219m)</i>	(8) <i>Science &amp; Tech. life change too fast: disagree (E219m)</i>	(9) <i>Because Science &amp; Tech. world is better off (E234)</i>	(10) <i>Because Science &amp; Tech. world is better off (E234)</i>	(11) <i>Because Science &amp; Tech. world is better off (E234)</i>	(12) <i>Because Science &amp; Tech. world is better off (E234)</i>
<b>Religious person</b>	<b>-0.232<sup>***</sup></b> (0.047)				<b>-0.181<sup>***</sup></b> (0.039)				<b>0.032</b> (0.039)			
<b>Importance of religion</b>		<b>-0.419<sup>***</sup></b> (0.024)				<b>-0.137<sup>***</sup></b> (0.021)				<b>-0.019</b> (0.020)		
<b>Importance of God</b>			<b>-0.144<sup>***</sup></b> (0.009)				<b>-0.094<sup>***</sup></b> (0.007)				<b>0.024<sup>***</sup></b> (0.007)	
<b>Church attendance</b>				<b>-0.046<sup>***</sup></b> (0.009)				<b>-0.007</b> (0.007)				<b>-0.002</b> (0.007)
<i>Female</i>	-0.080 <sup>**</sup> (0.032)	-0.038 (0.031)	-0.038 (0.032)	-0.091 <sup>***</sup> (0.033)	-0.045 <sup>*</sup> (0.027)	-0.051 <sup>*</sup> (0.027)	-0.025 (0.027)	-0.055 <sup>**</sup> (0.028)	-0.134 <sup>***</sup> (0.027)	-0.125 <sup>***</sup> (0.027)	-0.139 <sup>***</sup> (0.027)	-0.134 <sup>***</sup> (0.028)
<i>Age</i>	-0.004 <sup>***</sup> (0.001)	-0.002 <sup>**</sup> (0.001)	-0.003 <sup>**</sup> (0.001)	-0.004 <sup>***</sup> (0.001)	-0.002 <sup>**</sup> (0.001)	-0.002 <sup>**</sup> (0.001)	-0.002 <sup>*</sup> (0.001)	-0.002 <sup>**</sup> (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)
<i>Education</i>	-0.006 (0.009)	-0.008 (0.009)	-0.007 (0.009)	0.002 (0.009)	-0.047 <sup>***</sup> (0.007)	-0.049 <sup>***</sup> (0.007)	-0.048 <sup>***</sup> (0.007)	-0.042 <sup>***</sup> (0.007)	0.056 <sup>***</sup> (0.007)	0.057 <sup>***</sup> (0.007)	0.057 <sup>***</sup> (0.007)	0.059 <sup>***</sup> (0.008)
<i>Social class</i>	-0.037 <sup>*</sup> (0.020)	-0.038 <sup>*</sup> (0.020)	-0.032 (0.020)	-0.048 <sup>**</sup> (0.021)	0.004 (0.017)	0.003 (0.017)	0.010 (0.017)	0.004 (0.018)	0.028 (0.018)	0.029 <sup>*</sup> (0.018)	0.026 (0.017)	0.043 <sup>**</sup> (0.018)
<i>Income</i>	0.042 <sup>***</sup> (0.009)	0.038 <sup>***</sup> (0.009)	0.035 <sup>***</sup> (0.009)	0.044 <sup>***</sup> (0.010)	0.015 <sup>**</sup> (0.008)	0.016 <sup>**</sup> (0.008)	0.013 (0.008)	0.018 <sup>**</sup> (0.008)	0.074 <sup>***</sup> (0.008)	0.075 <sup>***</sup> (0.008)	0.076 <sup>***</sup> (0.008)	0.069 <sup>***</sup> (0.008)
<i>Constant</i>	-6.435 <sup>***</sup> (0.290)	-7.960 <sup>***</sup> (0.297)	-5.908 <sup>***</sup> (0.293)	-6.829 <sup>***</sup> (0.312)	-7.520 <sup>***</sup> (0.247)	-8.051 <sup>***</sup> (0.256)	-7.146 <sup>***</sup> (0.250)	-7.703 <sup>***</sup> (0.267)	4.743 <sup>***</sup> (0.204)	4.674 <sup>***</sup> (0.216)	4.660 <sup>***</sup> (0.205)	4.746 <sup>***</sup> (0.227)
<i>Observations</i>	31978	32512	32466	30427	32413	32983	32921	30883	32651	33199	33162	31198
<i>Adjusted R<sup>2</sup></i>	0.140	0.148	0.149	0.141	0.067	0.067	0.072	0.069	0.098	0.096	0.098	0.094

Robust standard errors in parentheses. \*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%. OLS estimates. All regressions include controls (not reported) for country, town size, religious denomination and year. Belief in God has not been included because of the absence of observations.

Table 2a: Attitudes Toward New vs. Old Ideas, Creativity, and Risk-Taking

	(1) <i>New ideas are better than old: agree (E046)</i>	(2) <i>New ideas are better than old: agree (E046)</i>	(3) <i>New ideas are better than old: agree (E046)</i>	(4) <i>New ideas are better than old: agree (E046)</i>	(5) <i>New ideas are better than old: agree (E046)</i>	(6) <i>Imp. of new ideas &amp; being creative (A189m)</i>	(7) <i>Imp. of new ideas &amp; being creative (A189m)</i>	(8) <i>Imp. of new ideas &amp; being creative (A189m)</i>	(9) <i>Imp. of new ideas &amp; being creative (A189m)</i>	(10) <i>Imp. of new ideas &amp; being creative (A189m)</i>	(11) <i>Imp. of adv. &amp; risk taking (A195m)</i>	(12) <i>Imp. of adv. &amp; risk taking (A195m)</i>	(13) <i>Imp. of adv. &amp; risk taking (A195m)</i>	(14) <i>Imp. of adv. &amp; risk taking (A195m)</i>	(15) <i>Imp. of adv. &amp; risk taking (A195m)</i>
<i>Religious person</i>	-0.197*** (0.037)					0.073*** (0.020)					-0.094*** (0.023)				
<i>Importance of religion</i>		-0.013 (0.017)					0.039*** (0.011)					-0.038*** (0.012)			
<i>Believe in God</i>			-0.131** (0.063)					0.067* (0.456)					-0.903* (0.522)		
<i>Importance of God</i>				-0.001 (0.006)					0.015*** (0.004)					-0.022*** (0.004)	
<i>Church attendance</i>					-0.022*** (0.007)					0.024*** (0.004)				-0.006 (0.004)	
<i>Female</i>	-0.084*** (0.028)	-0.098*** (0.027)	-0.105*** (0.028)	-0.098*** (0.028)	-0.082*** (0.027)	-0.141*** (0.014)	-0.146*** (0.014)	-0.156*** (0.049)	-0.146*** (0.014)	-0.139*** (0.015)	-0.309*** (0.016)	-0.314*** (0.016)	-0.299*** (0.060)	-0.310*** (0.016)	-0.317*** (0.017)
<i>Age</i>	-0.018*** (0.001)	-0.018*** (0.001)	-0.018*** (0.001)	-0.018*** (0.001)	-0.018*** (0.001)	-0.005*** (0.001)	-0.005*** (0.001)	-0.004** (0.002)	-0.005*** (0.001)	-0.005*** (0.001)	-0.016*** (0.001)	-0.016*** (0.001)	-0.025*** (0.002)	-0.016*** (0.001)	-0.016*** (0.001)
<i>Education</i>	0.013* (0.007)	0.011 (0.007)	0.014* (0.007)	0.012 (0.007)	0.010 (0.007)	0.059*** (0.004)	0.059*** (0.004)	0.074*** (0.011)	0.059*** (0.004)	0.059*** (0.004)	0.011** (0.004)	0.012*** (0.004)	0.019 (0.014)	0.012*** (0.004)	0.011** (0.005)
<i>Social class</i>	0.054*** (0.017)	0.053*** (0.017)	0.054*** (0.017)	0.053*** (0.017)	0.055*** (0.017)	0.076*** (0.009)	0.075*** (0.009)	0.002 (0.033)	0.074*** (0.009)	0.080*** (0.009)	0.063*** (0.010)	0.061*** (0.010)	-0.018 (0.040)	0.060*** (0.010)	0.058*** (0.011)
<i>Income</i>	0.020*** (0.007)	0.025*** (0.007)	0.021*** (0.007)	0.025*** (0.007)	0.025*** (0.007)	0.018*** (0.004)	0.018*** (0.004)	0.023 (0.016)	0.018*** (0.004)	0.016*** (0.004)	0.021*** (0.005)	0.021*** (0.005)	0.067*** (0.020)	0.021*** (0.005)	0.025*** (0.005)
<i>Constant</i>	6.928*** (0.631)	5.864*** (0.341)	6.040*** (0.346)	5.887*** (0.345)	6.740*** (0.632)	-2.504*** (0.123)	-2.339*** (0.130)	-1.937*** (0.658)	-2.539*** (0.124)	-2.319*** (0.134)	-2.661*** (0.139)	-2.827*** (0.146)	-1.403* (0.820)	-2.622*** (0.142)	-2.836*** (0.150)
<i>Observations</i>	40006	41508	39276	40634	41231	35008	35667	2360	35598	33279	34957	35618	2361	35550	33249
<i>Adjusted R<sup>2</sup></i>	0.190	0.188	0.195	0.191	0.190	0.099	0.099	0.044	0.099	0.101	0.156	0.155	0.080	0.155	0.164

Robust standard errors in parentheses. \*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%. OLS estimates. All regressions include controls (not reported) for country, town size, religious denomination and year.

Table 2b: Attitudes Toward Change and Belief in Shaping Own Fate

Dependent variable	(16) <i>People</i> <i>shape their</i> <i>fate:</i> <i>agree</i> (F198)	(17) <i>People</i> <i>shape their</i> <i>fate:</i> <i>agree</i> (F198)	(18) <i>People</i> <i>shape their</i> <i>fate:</i> <i>agree</i> (F198)	(19) <i>People</i> <i>shape their</i> <i>fate:</i> <i>agree</i> (F198)	(20) <i>People</i> <i>shape their</i> <i>fate:</i> <i>agree</i> (F198)	(21) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(22) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(23) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(24) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(25) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(26) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(27) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(28) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(29) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)	(30) <i>Att. Toward</i> <i>Change:</i> <i>welcome</i> <i>possibilities</i> (E047)
<i>Religious person</i>	-0.152*** (0.041)					-0.113 (0.074)					-0.171*** (0.056)				
<i>Importance of religion</i>		-0.163*** (0.021)					-0.035 (0.034)					-0.075*** (0.026)			
<i>Believe in God</i>			-1.311* (0.750)					-0.437*** (0.137)					-0.424*** (0.082)		
<i>Importance of God</i>				-0.045*** (0.008)					-0.019 (0.014)					-0.025** (0.010)	
<i>Church attendance</i>					-0.011 (0.007)					-0.037*** (0.014)					-0.048*** (0.011)
<i>Female</i>	-0.275*** (0.029)	-0.260*** (0.029)	-0.410*** (0.115)	-0.264*** (0.029)	-0.298*** (0.030)	-0.198*** (0.058)	-0.170*** (0.058)	-0.134** (0.061)	-0.136** (0.061)	-0.136** (0.056)	-0.245*** (0.048)	-0.221*** (0.047)	-0.129** (0.054)	-0.208*** (0.049)	-0.166*** (0.046)
<i>Age</i>	-0.005*** (0.001)	-0.004*** (0.001)	-0.016*** (0.005)	-0.005*** (0.001)	-0.005*** (0.001)	-0.022*** (0.002)	-0.023*** (0.002)	-0.022*** (0.002)	-0.022*** (0.002)	-0.024*** (0.002)	-0.025*** (0.002)	-0.025*** (0.002)	-0.023*** (0.002)	-0.023*** (0.002)	-0.027*** (0.002)
<i>Education</i>	0.117*** (0.008)	0.117*** (0.008)	0.080*** (0.026)	0.118*** (0.008)	0.121*** (0.008)										
<i>Social class</i>	0.080*** (0.019)	0.081*** (0.019)	0.185** (0.080)	0.082*** (0.019)	0.086*** (0.020)										
<i>Income</i>	0.081*** (0.009)	0.079*** (0.008)	0.047 (0.040)	0.079*** (0.009)	0.081*** (0.009)										
<i>Constant</i>	7.088*** (0.259)	6.412*** (0.269)	10.373*** (1.181)	7.265*** (0.261)	6.839*** (0.280)	5.564*** (0.736)	4.701*** (0.748)	5.911*** (0.763)	5.690*** (0.766)	5.478*** (0.735)	8.158*** (0.115)	7.230*** (0.119)	8.286*** (0.132)	8.167*** (0.128)	7.878*** (0.141)
<i>Observations</i>	35919	36577	2360	36533	34177	10362	10587	9580	9758	11277	14702	15853	12132	14494	16107
<i>Adjusted R<sup>2</sup></i>	0.191	0.191	0.029	0.191	0.164	0.056	0.058	0.048	0.049	0.060	0.066	0.061	0.059	0.057	0.068

Robust standard errors in parentheses. \*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%. OLS estimates. All regressions in columns (16)–(20) include controls (not reported) for country, town size, religious denomination and year. Regressions in columns (21)–(25) include controls (not reported) for country, religious denomination and year. Regressions in columns (25)–(30) only include controls (not reported) for country and year, allowing for about a 50% increase in sample size.

Table 3: Most Important Qualities for Children To Have

Dependent variable	(1) <i>Imp. of child independ. (A029)</i>	(2) <i>Imp. of child independ. (A029)</i>	(3) <i>Imp. of child independ. (A029)</i>	(4) <i>Imp. of child independ. (A029)</i>	(5) <i>Imp. of child independ. (A029)</i>	(6) <i>Imp. of child imagination (A034)</i>	(7) <i>Imp. of child imagination (A034)</i>	(8) <i>Imp. of child imagination (A034)</i>	(9) <i>Imp. of child imagination (A034)</i>	(10) <i>Imp. of child imagination (A034)</i>	(11) <i>Imp. of child determin. (A039)</i>	(12) <i>Imp. of child determin. (A039)</i>	(13) <i>Imp. of child determin. (A039)</i>	(14) <i>Imp. of child determin. (A039)</i>	(15) <i>Imp. of child determin. (A039)</i>
<b>Religious person</b>	-0.045*** (0.005)					-0.032*** (0.004)					-0.041*** (0.005)				
<b>Importance of religion</b>		-0.040*** (0.002)					-0.024*** (0.002)					-0.047*** (0.002)			
<b>Believe in God</b>			-0.054*** (0.010)					-0.038*** (0.009)					-0.066*** (0.011)		
<b>Importance of God</b>				-0.016*** (0.001)					-0.008*** (0.001)					-0.013*** (0.001)	
<b>Church attendance</b>					-0.009*** (0.001)					-0.006*** (0.001)					-0.008*** (0.001)
<i>Female</i>	0.008** (0.003)	0.012*** (0.003)	0.003 (0.004)	0.014*** (0.003)	0.007** (0.003)	-0.010*** (0.003)	-0.008*** (0.003)	-0.011*** (0.003)	-0.008*** (0.003)	-0.011*** (0.003)	-0.019*** (0.003)	-0.014*** (0.003)	-0.020*** (0.004)	-0.017*** (0.003)	-0.022*** (0.003)
<i>Age</i>	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
<i>Education</i>	0.014*** (0.001)	0.014*** (0.001)	0.017*** (0.001)	0.014*** (0.001)	0.014*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.010*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.018*** (0.001)	0.018*** (0.001)	0.016*** (0.001)	0.018*** (0.001)	0.019*** (0.001)
<i>Social class</i>	0.001 (0.002)	0.002 (0.002)	-0.001 (0.002)	0.002 (0.002)	0.002 (0.002)	0.004** (0.002)	0.004*** (0.002)	-0.002 (0.002)	0.004** (0.002)	0.004** (0.002)	0.002 (0.002)	0.004** (0.002)	0.001 (0.002)	0.004* (0.002)	0.002 (0.002)
<i>Income</i>	0.007*** (0.001)	0.007*** (0.001)	0.006*** (0.001)	0.007*** (0.001)	0.007*** (0.001)	0.001 (0.001)	0.001 (0.001)	0.002** (0.001)	0.001 (0.001)	0.001 (0.001)	0.005*** (0.001)	0.004*** (0.001)	0.008*** (0.001)	0.004*** (0.001)	0.005*** (0.001)
<i>Constant</i>	0.276** (0.127)	0.159 (0.129)	0.298** (0.129)	0.370*** (0.128)	0.219* (0.129)	0.235*** (0.087)	0.165* (0.087)	0.231*** (0.087)	0.278*** (0.087)	0.199** (0.086)	0.598*** (0.133)	0.474*** (0.130)	0.631*** (0.133)	0.673*** (0.132)	0.542*** (0.132)
<i>Observations</i>	93028	95902	58294	94827	93242	93028	95902	58294	94827	93242	89348	92200	55545	92078	89536
<i>Adjusted R<sup>2</sup></i>	0.141	0.145	0.146	0.145	0.141	0.067	0.068	0.067	0.068	0.069	0.060	0.064	0.065	0.062	0.061

Robust standard errors in parentheses. \*Significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%. OLS estimates. All regressions include controls (not reported) for country, own size, religious denomination and year.