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The Big Carrot: High-stakes Incentives Revisited

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ABSTRACT

Using an international dataset of about 35 000 subjects, this paper provides an empirical example of high-stakes incentives in relation to religious practice. First, we show that incentives (based on absolute belief) play a salient role in religious performance. Second, we find that when both positive (heaven) and negative (hell) incentives are available the former are more effective than the latter. Specifically, it is shown that beliefs in heaven are much more relevant than beliefs in hell when estimating the production of religious commodities (church-attendance and praying equations). Copyright © 2009 John Wiley & Sons, Ltd.

KEY WORDS carrot/stick; high-stakes incentives; rewards; punishment; economics of religion

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If you erroneously believe in God, you lose nothing (assuming that death is the absolute end), whereas if you correctly believe in God, you gain everything (eternal bliss). But if you correctly disbelieve in God, you gain nothing (death ends all), whereas if you erroneously disbelieve in God, you lose everything (eternal damnation).

Pascal's argument (extracted from 'Pensées').

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INTRODUCTION

Recently, three salient topics have increased interest in the role of incentives in economic decisions: The loss aversion theory (e.g. Tversky & Kahneman, 1991); the effectiveness of punishment (vs. rewards) in experimental settings (Andreoni, Harbaugh, & Vesterlund, 2003; Nikiforakis, 2008) and how results may vary when incentives are substantially larger—high-stakes incentives (Slonim & Roth, 1998).

Following Azzi and Ehrenberg (1975) it is assumed that subjects invest in religious activities (church attendance and prayer) as necessary conditions for reaching heaven and avoiding hell. Heaven and hell therefore serve as incentives for religious behaviour. An interesting question that follows is whether religious activity of individuals is indeed affected by the degree of their belief in after-life. Moreover, is religious behaviour affected differently by belief in heaven (that relates to a gain/reward) and in hell (that expresses a loss/punishment)?

This paper provides an empirical example of the effect of high-stakes incentives on religious practice, using about 35 000 personal observations. It shows that the positive (heaven = gain) and negative (hell = loss) after-life incentives significantly affect religious behaviour.

However, the effectiveness of punishment, when rewards are also available, is small. Thus, our data support the linkage between incentives and performance but do not provide evidence in favour of the loss aversion theory that would suggest that the disutility of 'eternal damnation' is larger than the utility of 'eternal bliss'.[1]

The statistical approach is simple. Using the ISSP 1998: Religion II dataset, which focuses on religious individual behaviour, we estimate church-attendance equations and prayer equations (see for instance Brañas-Garza & Neuman, 2004). Church attendance and prayer are both measures of religious practice that, obviously, might be affected by incentives.

In addition to a battery of childhood and socio-demographic explanatory variables (and controlling for country-specific variables), we introduced our two core variables:

- $\text{carrot}_i = 1$ if the ith individual absolutely believes in heaven, and
- $\text{stick}_i = 1$ if s/he absolutely believes in hell.

Alternatively, in order to explore the effect of the lack of incentives, the estimation was repeated using dummies for those who do not believe at all in the existence of heaven (nocarrot_i) or in hell (nostick_i). In a similar vein, the 'reversed' loss aversion hypothesis will also be that absolute disbelief in hell should have a stronger (negative) effect on religious performance compared to the absolute disbelief in heaven.

It was found that the effect of the carrot (heaven) is more than three times as large as the effect of the stick (hell). Consistently, we also found that the (negative) effect of the lack of belief in the existence of heaven is triple the effect of the lack of belief in the existence of hell. To conclude, in the presence of the largest possible stakes (infinitum rewards or punishment),[2] rewards (carrots) are more effective than punishment (stick) in encouraging religious practice (for a review on carrot/stick incentives see Andreoni et al., 2003).

LITERATURE OVERVIEW

The determinants of religious behaviour and practice have been studied intensively within the various disciplines of the social sciences (in particular, within sociology, psychology, anthropology and economics).

[1]Given that 'death as the absolute end' is the baseline, then, 'stay in heaven = eternal bliss' is a 'positive' deviation (representing a 'gain'), while 'stay in hell = eternal damnation' is a 'negative' deviation from the baseline (representing a 'loss'). The standard loss aversion theory claims that the disutility of a loss is larger than the utility of a parallel gain, leading to an expected stronger effect of the belief in hell. Obviously, we are stretching here the loss aversion theory that refers to finite and immediate losses/gains. Within the 'concluding remarks' in the last section, there is some reference to the questions of 'size' and 'discounting'.

[2]Recall Pascal's argument (extracted from 'Pensées') cited above. He refers to infinite bliss and damnation. Interestingly, Pascal is using the same terms that modern economics uses, when he refers to 'gains' versus 'losses'.

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The literature considered both personal-level variables (education, age, gender, etc.) and state-level determinants (e.g. state diversity of religions, institutions, political organizations and type of society/culture). There is a vast literature on this topic, and its review is beyond the scope of this paper. However, a brief overview of closely related literature on theoretical and quantitative analyses of (i) religious practice; (ii) incentives and (iii) punishment versus rewards, adds new perspectives and places our reported results within a scientific theoretical framework.

Religious practice: Demand-side versus supply-side theories and evidence

Two types of theories have been offered for the analysis of religious practice, demand-side models versus supply-side models: (1) Demand-side models characterize many of the studies within the sociological/psychological disciplines. Demand-side theories are in line with the 'secularization hypothesis' that first appeared in Weber (1930), who credited the idea to Wesley's writings in the late 1700s. This research area has a rich and well-documented tradition that has manifested as an academic debate encompassing several decades of scholarly discourse and study. Numerous studies offer both supportive and contradictory evidence for the core principles of the secularization thesis.[3] To mention just a few of these: Support for the secularization thesis can be found in Chaves (1994); Yamane (1997) and Sommerville (1998). The leading critics of the secularization theory include the Americans Greeley (1985); Finke (1992); Warner (1993) and Stark (1999). Swatos and Christiano (1999) provide a historical overview of the secularization thesis and debate. (2) Supply-side models (sometimes referred to as market models) are more common in the economic literature and are relatively new. The leading proponents of the Market Theory of religiosity are Iannaccone, Finke, and Stark (e.g. Iannaccone, 1991; Finke, 1992; Finke & Iannaccone, 1993; Stark, 1999, to mention very few among many others). Others argue that supply-side theories are problematic. Important counter arguments were made by Breault (1989a,b), Olson (1999) and Chaves and Gorski (2001).

In most cases, the two distinctive types of models lead to different and sometimes opposing conclusions/hypotheses. Survey data can be used for the statistical testing of the various hypotheses, lending support to one model against the other. Two examples will be used to illustrate the difference between the supply-side versus demand-side theories:

(i) *What is the relationship between state religious pluralism and secularization*? The 'supply-side' or 'market' theory predicts *less* secularization (*more* religious adherence) in countries which are more religiously-diverse, and at the other end, the 'demand-side' theory expects *more* secularization in more religiously pluralistic states.

The *supply-side approach* treats churches as firms producing a mix of valuable products in a 'religious market' (e.g. Ekelund, Herbert, & Tollison, 1989; Thronton, 1992 and Iannaccone, 1991). If religious markets function like other markets, then a greater diversity of religions available in a country is said to promote greater competition, and hence, a religion product of higher quality. Religiously pluralistic markets would stimulate churches to produce religious services well adapted to the needs of religious consumers, thereby increasing 'religious consumption' (e.g. church attendance) (examples of such studies include Iannaccone, 1992, 1995; Finke & Stark 1988, 1992; Finke & Iannaccone, 1993 and Stark & Iannaccone, 1994). An often cited example for the positive relationship between pluralism and religiosity is the United States, which among the industrialized nations, has both the highest levels of religious

[3]The concept 'secularization' has been used in the literature to refer to diverse aspects such as: (i) Differentiation of society's major institutions (law, politics, economy, education, etc.) from religious influence; (ii) rationalization (Wilson, 1966; Martin, 1978); (iii) demystification of all spheres of life; (iv) less adherence to religious acts such as attendance of religious services and prayer. Here, we only refer to this last aspect of secularization. Sommerville (1998) sorted out the different aspects of secularization and divided them into two categories: (i) Those presented in terms of processes (like decline, differentiation, disengagement, rationalization); or (ii) in terms of aspects of life or levels of analyses (structural, cultural, organizational, individual). We refer to 'secularization' as a decline in individual religious practice. Tschannen (1991) provides an inventory of the elements of classic theories of secularization.

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pluralism and one of the highest rates of church attendance (e.g. Warner, 1993; although Hout & Fischer, 2002, reported opposed facts). Thus, more religious diversity stimulates greater religious participation (less secularization).

The efficiency of religion providers is furthermore decreased if there is a state-religion and greater state-regulation of religion—measured, for instance, by whether the government appoints or approves church leaders (Chaves & Cann, 1992). The supply-side theory would therefore expect more secularization in countries with state-religion and state-regulation of religion. An often cited example in this context is Sweden that had a state-religion (until the year 2000) and also exhibited high rates of secularization, mainly among young people who were born to religious parents, and switched to 'no religion' (Shy, 2007, p. 1133). However, a state-religion and state-regulation of religion also typically involve subsidies such as: payments to church employees, favourable tax schemes for the religion sector, building churches and religious institutions, subsidies to religious schools and curricula and collection of taxes dedicated to church uses. Economic speculation suggests that these subsidies would encourage religious activity (more personnel and improved facilities attract more churchgoers) and create a positive effect on religious participation. The overall effect of state-religion and state-regulation on religious participation is therefore ambiguous.

At the other end, the literature presents long-standing *demand-side views* that claim the very opposite: More diversity leads to less participation (higher secularization). In countries with a diversity of religious denominations, individuals are exposed to a variety of religion products and this might weaken their ties with the religion they were raised in (e.g. Kelley, 1977; Sherkat, 1991). The process of disaffiliation is further magnified by intermarriage. If there is a dominant denomination, a high proportion of marital unions will bring together two people with the same religious affiliation. On the other hand, in a multi-religion country there are higher prospects of intermarriage. Intermarriage reduces the probability of religious affiliation for the offspring and increases the likelihood of disaffiliation for the spouses (Voas, 2003).

The conflicting effects that religious diversity has on religious affiliation leaves, therefore, the question of the *observed* relationship between religious diversity and secularization unanswered. A considerable amount of empirical work has explored this issue; some seem to support one side and some the other (see Chaves & Gorski, 2001, who presented a major review of 193 tests in 26 published paper). Negative effects of pluralism on religious activity were reported in Breault (Breault, 1989a,b) and in Olson (1999). They both argue against findings of a positive relationship that were presented in Finke and Stark (1988). In all probability, both supply and demand forces exist in society and both shape the relationship between religious diversity and secularization. The relationship's direction is determined by the *more dominant* force.

(ii) *After-life beliefs and religious behaviour:* The second illustration is related to the topic of the present study, namely, differences between societies in the prevalence of beliefs in the after-life (hell and heaven), and the differential effects of these two types of after-life beliefs on religious practice.

Supply-side theories claim that church doctrine regarding the after-life is an *endogenous* variable used by the church to expropriate rent and/or to encourage appropriate social behaviour. Ekelund et al. (1989) suggest that church officials are using heaven and hell as tools to increase their material wealth: They promise heaven to those who transfer wealth to church officials and threaten hell to those who do not. Hull and Bold (1989, 1994) argue that heaven and hell are effective methods for encouraging members to produce valuable social behaviour: '*Heaven rewards desirable behaviour and hell increases the expected cost of misbehaviour, causing an increase in enforcement effectiveness*' (Hull & Bold, 1994, p. 449). Frank (1988) supports this argument by illustrating the potential influence heaven and hell can have in preventing undesirable opportunistic behaviour. Hull and Bold (1994) claim that a correlation exists between the developmental stage of a country and the prevalence of its population's religious doctrines such as after-life beliefs. They predict that after-life religious doctrines will be most important and effective in producing social goods in cultures with intermediate complexity of property rights, production technology, trade relations and social interaction. The rationale for this assertion is the following: In simple cultures that are organized around extended families that share wealth and enforce appropriate family member behaviour, religious doctrines

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would be effective but are not needed. On the other hand, in very large and technologically complex communities, religious doctrines are needed but are less effective. Therefore, religious doctrines of heaven and hell will prevail mainly in countries with an intermediate level of development. They use data from the Human Relations Area Files that tend to support this model's prediction. In an attempt to test their prediction for more developed societies in 1998, we employed data of 32 countries from the 1998 ISSP database and looked at the relationship between state development (measured by per-capita GDP) and intensity of belief in the after-life, but did not find any correlation pattern between these two elements (see 'Further discussion: National effects' section). Therefore, our data do not support Hull and Bold's prediction, which is grounded in supply-side theories.

On the other hand, demand-side theories relate to the belief in heaven and hell as an *exogenous* variable. Doctrines of heaven and hell do not arise as a response to the need for social order. Like many other beliefs they are formulated during childhood and transmitted from religious parents and teachers to the offspring (Brañas-Garza & Neuman, 2006, 2007; Bar-El, Neuman, & Tobol, 2008). The sociological literature distinguishes between beliefs, attitudes, intentions and behaviour. It assumes a causal chain linking beliefs to the person's attitudes; beliefs and attitudes to intentions and intentions to behaviour (Fishbein & Ajzen, 1975, p. vi and chapter 8. A summary of studies related to the chain 'beliefs-attitudes-intentions-behaviour' is presented in Table 8.1, pp. 337–339).

Beliefs in the after-life (like other types of beliefs and norms) are most probably transmitted from one generation to the next and shaped during the formative years of childhood (see for instance: Argyle & Beit-Hallahmi, 1975; Bisin & Verdier, 2000, 2001; Brañas-Garza & Neuman, 2006). These beliefs then motivate believers to intensify their religious behaviour (demonstrated by church attendance and prayer) in order to enjoy heaven and avoid hell. It is belief that determines practice, rather than the other way around. The empirical analysis presented in this paper follows this demand-side theory and examines the association (in terms of existence and degree) between belief in heaven/hell and religious practice, expressed in the forms of church service attendance and prayer.

Incentives and high-stakes incentives

The promise of an after-life serves as an incentive for the believers to practice religious behaviour.

There is a vast literature on incentives and their effect on performance. Two types of incentives are suggested by the literature: (i) Financial rewards and (ii) pro-social incentives. The latter are more relevant for the performance of socially valued actions.

(i) The economics literature emphasizes monetary rewards and claims that rewards can positively affect performance. Experimental economics was used intensively to test this relationship between monetary rewards and performance (e.g. Smith & Wakker, 1993; Hertwig & Ortmann, 2001; Rydval & Ortmann, 2004).[4] In order to test the effectiveness of *increased financial payments* on economic behaviour *high-stakes financial rewards* have been offered in several experimental designs. Slonim and Roth (1998) and List and Cherry (2000) tested the Ultimatum Game under high-stakes incentives (up to 25 times larger than the standard). They found that while under standard incentives, players (both proposers and responders) rarely played a Nash Equilibrium game, when incentives were substantially enlarged the percentage of subjects who played a Nash Equilibrium Ultimatum Game increased accordingly. Contrary to these results Oberholzer-Gee, Waldfogel and White (2003) did not find evidence for the magnified effect of high-stakes incentives in cooperative games. Also, List and Cherry (2008) did not find a high-stakes effect in Dictator Games. The results are therefore inconclusive (see Levitt & List, 2007).

[4]Most experimental studies on the role of financial incentives ignore differences in cognitive production of respondents. Camerer and Hogarth (1999) argue that the interpretation of experimental results should be conditional not only on the particular financial incentives employed, but also on the cognitive abilities of the experiment's participants. Rydval and Ortmann (2004), drawing on the data in Gneezy and Rustichini (2000a), show that the effects of financial incentives on performance were less important than cognitive abilities of the respondents.

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In a similar vein, Gneezy and Rustichini (2000a) claimed that the payment should be large enough for affecting effort and performance. These authors' results suggest (as succinctly summarized by the title of their paper: '*Pay enough or don't pay at all*') that the experimenter ought to pay enough or not pay at all. They conjectured that their minimally paid subjects might have been insulted by the microscopic compensation offered to them and consequently performed worse than subjects who were driven only by their intrinsic motivation.

(ii) Social motivation is prevalent in actions that have a social/religious/moral aspect (see Andreoni, 2006; and Meier, 2007, for surveys on experimental evidence for pro-social preferences). Examples are blood donation (e.g. Ferrari, Barone, Jason, & Rose, 2001; Goette & Stutzer, 2008; Mellstrom & Johannesson, 2008) and charity (Gneezy & Rustichini, 2000a; Frey & Meier, 2004; Landry, Lange, List, Price, & Rupp, 2006). It was argued that adding financial benefits to pro-social activities can undermine the motivation, lead to 'crowding out' and eventually to *less* pro-social behaviour (Titmuss, 1971). The 'crowding out' hypothesis was initially met with skepticism by economists (Solow, 1971). Later on, economists found experimental evidence for the 'crowding out' theory (see Frey & Oberholzer-Gee, 1997; and Frey & Jegen, 2001, for a survey of such empirical evidence) and developed different economic models to explain the empirical evidence (Gneezy & Rustichini, 2000b; Benabou & Tirole, 2006; Sliwka, 2007; Ellingsen & Johannesson, 2008).

In this paper, we look at a different type of incentives that are neither financial nor pro-social. The reward for a religiously practicing individual is believed to be received in the after-life. Those who definitely believe in heaven and/or hell are confident (subjective probability of 100%) that they will be highly rewarded (or punished) after death and therefore after-life is an example of high-stakes incentives for religious behaviour.[5] The question is therefore if these incentives also affect performance (participation in mass services and praying) as predicted by the incentives literature. Another interesting question is whether financial rewards that would be granted to religiously practicing individuals, will 'crowd out' the after-life incentives and eventually lead to less religious practice. This is a hypothetical question that cannot be tested with our database. Also, church attendees might have other incentives too for attending church services such as networking and social incentives. It is not possible to disentangle the after-life and the social incentives. However, praying, which is a private/intimate religious activity, does not have any social dimensions. The effect of belief in after-life and religious performance is therefore clearer and cleaner in the context of praying.

The effectiveness of punishment and loss aversion (positive vs. negative incentives)

Hull and Bold (1989) raise the question: 'Why invent hell?' (p. 450). Why would not the church simply increase without limit the rewards in heaven rather than also increasing the cost of misbehaviour by threatening punishment in hell? The answer they give is that the introduction of unpleasant hell is more effective in altering individual behaviour than an increase in the claimed wealth in heaven, due to diminishing marginal effects of utility of heaven.

There is a vast literature on punishment as a powerful device for the enforcement of contracts and cooperation and for reducing anti-social behaviour (e.g. Andreoni et al., 2003; Nikiforakis, 2008). It was also suggested that individuals are ready to pay to punish others (altruistic punishment) if those subjects are selfish or do not behave according to accepted social rules (Fehr & Gächter, 2002; Falk, Fehr, & Fischbacher, 2005).

Moreover, in a recent paper, Nonneman (2007) showed that the effectiveness of the *threat* of punishment (not even actual punishment) was already acknowledged almost four centuries ago: The Socialist Theocracy of the Jesuits in Paraguay, 'La Misión' (1609–1767), was successfully run with the help of indoctrination instead of punishment.

Reference-dependent loss aversion theories can also be used to explain the effectiveness of hell in guaranteeing proper behaviour: The absolute subjective value of a change in an endowment is generally

[5]One of the referees mentioned that we deal with belief in incentives, rather than incentives per se. However, as we relate only to *absolute* believers, the believer relates to heaven/hell as a certain incentive.

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greater when the deviation from the reference point represents a loss than when the same-sized change is perceived as a gain. It follows that if the reference point is no after-life, individuals will attach a higher (negative) value to the loss of utility in hell than to the gain of utility in heaven.

The most systematic general theory of this kind is probably Tversky and Kahneman's (1991) reference-dependence model, which builds on Kahneman and Tversky's (1979) *Prospect Theory*. Numerous studies present evidence supporting the loss aversion hypothesis. They include: Hartman, Doane, and Woo (1991); Hardie, Johnson and Fader (1993); Andreoni (1995); Benartzi and Thaler (1995); Camerer, Babcock, Loewnstein, and Thaler (1997); Myagkov and Plott (1998); Bowman, Minehart and Rabin (1999); Jullien and Salanie (2000); Genesove and Mayer (2001); Neuman and Neuman (2008).

In a recent paper, Harinck, Van Dijk, Van Beest, and Mersmann (2007) showed that loss aversion can be reversed (in their words: '*Gains loom larger than losses*') when small amounts of money are concerned. It appears that individuals happily accept small gains but discount small losses. They also found typical loss aversion (losses loom larger than gains) for larger amounts of money. Although their results were replicated in several experiments using different settings and paradigms, more evidence is needed before a general conclusion is drawn.

As we are dealing with high-stakes after-life incentives, losses should loom larger than gains. It follows that belief in hell (loss) is assumed to be more effective in promoting active religious behaviour (such as participation in church activities and prayer) than belief in heaven (gain).

This study explored two basic questions: (i) Is religious behaviour affected by (high-stakes, non-monetary) incentives, so that performance is significantly correlated with the definite belief in heaven/hell? (ii) Are believers in heaven/hell loss averse in the sense that losses (hell) loom larger than gains (heaven), and consequently, the absolute belief in hell would have a stronger effect on religious performance than the absolute belief in heaven? To the best of our knowledge, the application of theories of incentives and loss aversion to religious performance is an innovative endeavour, not reported in the existing literature.

THE FRAMEWORK, SAMPLE, VARIABLES AND ECONOMETRIC MODEL

Framework

Following the A–E model (Azzi & Ehrenberg, 1975),[6] it is assumed that subjects have a quasi-concave utility function:

$$u = \mathrm{c}(\mathrm{c}_1, \ldots, \mathrm{c}_n, h)$$

where c_t represents the terrene consumption of goods and services in period t and h is the expected value of eternal bliss $(h \in R^+ + R^-)$. Following A–E (see footnote 9, p. 33) we also assume that the eternal bliss is a continuous, differentiable, concave function of the individual's effort by means of church-attendance (a_t) and prayer (p_t) in each period

$$h = h(\mathrm{a}_1, \mathrm{a}_2, ..., \mathrm{a}_n, \mathrm{p}_1, ..., \mathrm{p}_n)$$

It follows that individuals invest in religious activities in order to reach heaven and to avoid hell. Our analysis builds upon two major assumptions:[7]

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[6]Pyne (2008) uses a different approach based on subjective probabilities. This approach is much more convenient than ours but more theoretically complex. We selected the A–E approach because of its simplicity.

[7]We acknowledge comments of the two referees who suggested elaborating on these points. One of the referees noted that beliefs in heaven/hell are correlated with the subject's level of religiosity. In order to control for the respondent's level of religiosity, we add to the regression analysis 'self-reported' level of religiosity as one of the explanatory variables.

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1. A crucial assumption is that people trust that the attendance of church services and private prayer are good strategies in the salvation game: Reaching heaven and avoiding hell.
2. We are also assuming that the valuations of heaven (h^+) and hell (h^-) are identical in absolute terms: Infinite gain versus infinite loss. This assumption is crucial for a comparative analysis of the effects of heaven versus hell. Two explanatory variables are included in the regression analysis: Absolute belief in heaven and in hell. The 'stay in grave' alternative therefore serves as the reference group. An individual who believes neither in heaven nor in hell belongs to the default group of those who believe that after death there is no after-life and people 'stay in grave' ($h \in \{0\}$).

Hence, assuming that church attendance and prayer are strategies that lead to heaven and prevent hell, we explore

(1) if absolute belief in eternal bliss (heaven/gain) increases individual's religious investment that is reflected in church attendance and prayer. Same for absolute belief in eternal damnation (hell/loss), and
(2) if absolute belief in eternal damnation (hell/loss) is a more or less powerful incentive compared to eternal bliss (heaven/gain) for intensified religious effort.

We therefore compare the effects of positive versus negative incentives, by estimating the effects of heaven/hell incentives on religious performance (church attendance and prayer).Church attendance and prayer are two dimensions of religiosity that reflect public religious activities versus private/intimate prayer activities. While church attendance has also non-religious motives such as networking and establishing social ties, the private prayer activity has more pure religious motives.[8] An interesting question is whether the heaven/hell incentives play different roles in promoting the two different types of religious activity. A comparison of coefficients of church attendance and prayer equations will facilitate an answer to this question.

Sample

The data used for the empirical analysis were drawn from the module on National Identity of the 1998 International Social Survey Program (ISSP): Religion II. The ISSP is an ongoing effort devoted to cross-country research on national attitudes. It includes questions on attitudes, beliefs and opinions on various issues, as well as numerous questions regarding the individual's socio-economic background, together with information on parents and spouses. Individuals were sampled within the following 32 countries: Australia, Austria, Bulgaria, Canada, Chile, Cyprus, Denmark, France, West Germany, East Germany, Great Britain, Hungary, Japan, Israel, Italy, Ireland, Latvia, New Zealand, Northern Ireland, Norway, Poland, Portugal, Russia, Sweden, Slovenia, Spain, Switzerland, The Czech Republic, The Netherlands, The Philippines, The Slovak Republic and The United States.

Most of these countries are predominantly Christian (Catholic, Protestant, Orthodox, Lutheran, Anglican and other Christian faith). The sample is composed of Catholics: 45%; Protestants: 14.6%; Orthodox: 6.9%; Lutherans: 2.7%; a small share of respondents are Jewish (4%) or Moslem (1.1%); about 7.5% have other religions (e.g. Sikh, Buddhist, Hindu, Shinto, Free Presbyterian, Pentecostal, Mormon, Brethren, Episcopal) and 18.2% identify themselves as having 'no religion'. The data cover the European and Australian continents and North America. The African continent is excluded and South America and Asia are represented by a small number of countries (Chile, Israel, Japan and the Philippines). The research, therefore,

[8]The motives of private prayer are basically religious rather than social. However, prayer habits could also stem from endogenized social rules or personal needs.

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pertains to Europe, North-America and a few other countries. The more homogenous European sample is also analysed separately.

In order to arrive at an even more religiously homogenous sample, a sub-sample of the European countries that includes predominantly Catholic countries (where over 85% of the population is Catholic) was selected and analysed. This sub-sample includes: Spain, Italy, Poland, Ireland and Portugal.

Regression results for the three groups are presented and compared. Regressions were estimated using pooled country data, under the assumption that the effects of the independent variables are not different in the various countries included in the sample. The pooling of the data led to a very large sample (sample sizes within each of the countries were too small to allow a separate analysis for each country). Country specific variables were used to identify and control for country effects.[9]

Dependent variables and econometric approach

Two questions included in this dataset were used to define the two *dependent variables* (churchgoing and prayer):

- *Church (religious services) attendance*$_i$ is based on the question: 'How often do you attend religious services at a church?' and has six options: (1) Never; (2) once a year; (3) two or three times a year; (4) once a month; (5) two or three times a month and (6) at least once a week.

  The term 'church' is used as a generic term that relates to the relevant religious place of worship (e.g. also synagogue for Jews, mosque for Moslems, etc.). The religious rules of congregation vary between religions (e.g. many orthodox Jews congregate once or even twice a day, while Christians congregate once a week). However, the six categories of the question related to church attendance have levels that minimize this problem. For instance, the upper category is '*at least* once a week', and it covers the most observant respondents from all religions.
- *Prayer*$_i$ is based on the question: 'How often do you pray?' that has eleven alternative categories: (1) Never; (2) once a year; (3) twice a year; (4) few times a year; (5) about once a month; (6) two or three times a month; (7) almost every week; (8) every week; (9) several times a week; (10) once a day and (11) several times a day.

Here too, prayer obligations vary between religions (e.g. Jews need to pray three times a day; Moslems five times a day), but the upper category of 'several times a day' encompasses the most observant respondents. Church attendance is a public activity, whereas prayer is a private/intimate religious activity that has pure religious motives.

Ordered Logit models were estimated in order to utilize the full information on the dependent variables. In these estimations, the equations have a non-linear form. While interpretation of the coefficients in this model is difficult, the signs of the coefficients and their relative values provide important insights into the effects of the predictors of the model (see Brañas-Garza & Neuman, 2004, 2006 for more on Ordered Logit estimation of religious practice equations).

Independent variables

We used the following list of *independent variables* for the two sets of regressions (church-attendance and praying equations):

(i) *Dummy variables related to beliefs in heaven (carrot) and in hell (stick)*: These are our core variables and they were defined based on the following original dataset variables:

[9]Another option was to use fixed-effects regression models. The basic results for the core variables did not change when fixed-effects were used.

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- o *Heaven*$_i$ is based on the question: 'Do you believe in heaven?' that has four options: (1) Yes, definitely; (2) yes, probably; (3) no, probably not and (4) no, definitely not.
- o *Hell*$_i$ is based on the question: 'Do you believe in hell?' that has the same four options: (1) Yes, definitely; (2) yes, probably; (3) no, probably not and (4) no, definitely not.

Using these questions we defined the following explanatory variables regarding positive incentives (carrot), punishment (stick) and the lack of both (no-carrot; no-stick):

- Carrot$_i$ that takes the value of 1 if Heaven$_i = 1$ (that is the respondent definitely believes in heaven) and 0 otherwise.[10]
- Stick$_i = 1$ if Hell$_i = 1$ (the respondent definitely believes in hell) and 0 otherwise.
- No-carrot$_i$ that takes the value of 1 if Heaven$_i = 4$ (that is the respondent definitely does not believe in heaven) and 0 otherwise.
- No-stick$_i = 1$ if Hell$_i = 4$ and 0 otherwise (the respondent definitely does not believe in hell).

Obviously, an individual who *absolutely* believes in heaven (hell) faces a standard 'profit' maximization problem (see footnote 10). He relates to heaven (hell) as a 100% certain personal return (penalty) on his investment (lack of investment) in religious performance that is expressed in church attendance and private prayer. Moreover, the size of the premium and of the penalty will be 'infinitum' or at least extremely large.[11]

In order to control for other variables that also affect religious performance, and hence arrive at net effects of the heaven/hell incentives, the following explanatory variables were also included:

(ii) *Dummy variables related to the religious practice of the father, the mother and the respondent when he was 12 years old*: The ISSP provides information on church attendance of the respondent's father and mother and his own participation at church activities at the age of 12, by asking: 'When you were a child, how often did your father/mother/yourself attend church services?' The answer includes nine categories ranging from (1) never to (9) several times a week. The ISSP (1991 and 1998) appear to be the only multi-nation surveys to ask retrospective church attendance questions.[12]

While retrospective data are frequently questioned for their reliability, there is no reason to presume that people have special difficulties in recalling their religious backgrounds. Childhood attendance is a distinctive and well-defined activity, not easily confused with other activities, nor easily forgotten altogether. Individual rates of attendance tend not to vary much over time, thus limiting problems associated with the misdating of memories. People rarely confuse their childhood and adult experiences, and childhood is the only period when most people routinely observe their parents' religious activities. Iannaccone (2003) tests the reliability of ISSP retrospective attendance data by comparing them to GSS American data; American Catholic Surveys conducted in 1963 and 1974 by NORC and additional evidence from surveys conducted in Canada the US and Europe. He reaches the conclusion the ISSP data

[10]The category of believers (non-believers) includes only those individuals who chose the *definitely* yes (no) option. We also experimented with an alternative definition that added in the subjects who chose the *probably* yes (no) option to the group of believers (non-believers). The regression coefficients of the relevant variables changed accordingly but the pattern and conclusions did not change. We report the results that relate to the 'definite' option. Index Table A6 presents regression results for the broader category of the 'definitely + probably' option.

[11]With hyperbolic discounting, the present value of infinite rewards is infinite. However, with exponential or quasi-hyperbolic discounting, the present value of eternal bliss is finite (but still large). See Elster (2007, pp. 117–119).

[12]There is a major American survey, The General Social Surveys (GSS), that included analogous questions in 1983–1986, 1988 and 1989 (Davis & Smith, 1998), but they were administrated only in the US.

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'*stand up to numerous different tests of internal and external consistency*' (p. 34).[13] Three dummy variables, based on the retrospective data for church attendance of father/mother/child at 12, were defined:

- *Intensively practicing father* = 1; if the father attended church services almost every week (categories (7); (8); or (9)).
- *Intensively practicing mother* = 1; if the mother attended church services almost every week (same three categories).
- *Intensively practicing child* = 1; if the respondent, when he was 12 years old, attended church services almost every week (same three categories).

By not relating to a numerical variable and by combining three categories, we further minimize measurement errors resulting from the retrospective nature of the data.

(iii) *Self-reported religiosity level.* This variable is used to control for interpersonal differences in the importance that religion plays in the subject's life. Proper control of this personal feature facilitates the estimation of *net* effects of afterlife beliefs on religious activity. The variable *religiosity level* includes 7 categories: extremely religious, very religious, somewhat religious, neither religious nor non-religious, somewhat non-religious, very non-religious, extremely non-religious (our reference group).

(iv) The list of *socio-demographic variables* includes:

- age in years (four categories: over 60; 46-59; 31-45; 30 or below - as the reference group);
- education (three levels: academic education (full or partial); high school; elementary - as the reference group);
- marital status (married = 1);
- family size (number of people in household);
- The spouse defines his religious affiliation as 'no religion' = 1.

(v) We also controlled for *country specific variables*:

- *per-capita GDP* of the respondent's country (1998, in 2000 US$);[14]
- *country average level of church-attendance* (in church-attendance equations) and *country average level of prayer* (in prayer equations).

FINDINGS: DESCRIPTIVE DATA AND REGRESSION ANALYSIS

Sample characteristics

Table 1 presents the cross-distribution of the stick/carrot core variables. Three parallel cross-distributions are shown: For the whole sample (all the countries included in the survey); for European countries (both Catholics and non-Catholics) and for European predominantly Catholic countries (Spain, Italy, Ireland, Portugal and Poland).[15] The estimation of church attendance and prayer equations will also be repeated for these three sets of countries.

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[13]He even becomes poetic when he summarizes: '*Stop making do with scattered historical statistics, and tap the comprehensive history we collectively carry in our minds. Stop grinding the same old survey questions through ever more complex calculations, and begin mining the global storehouse of retrospective data. Let others wait for decades of polls spanning dozens of countries; reconstruct the past now'* (p. 33).

[14]Source: ERS International Macroeconomic Dataset (http://www.ers.usda.gov/Data/Macroeconomics/).

[15]The religious homogeneity of the populations (in European countries and mainly in European Catholic countries) also helps to overcome the problem of different perceptions of 'heaven' and 'hell' within different religions, e.g. in Japan, the majority of the population are both Shinto and Mahayana Buddhists—for them the concepts 'heaven' and 'hell' in the infinitum sense are irrelevant. You may reside for a time in a hell or heaven world—but you then reincarnate again.

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Table 1. Cross-distributions of the number (percentage) of believers/non-believers in the hell/stick and heaven/carrot, 1998

Whole sample	Carrot = 1	Carrot = 0	Total
Stick = 1	7131 (21.2%)	196 (0.6%)	7327 (21.8%)
Stick = 0	2355 (7.0%)	23 915 (71.2%)	26 270 (78.2%)
Total	9486 (28.2%)	24 111 (71.8%)	33 597 (100%)
European countries			
Stick = 1	4661 (17.8%)	143 (0.5%)	4804 (18.3%)
Stick = 0	1737 (6.6%)	19 707 (75.1%)	21 444 (81.7%)
Total	6398 (24.4%)	19 850 (75.6%)	26 248 (100%)
European Catholic countries			
Stick = 1	1509 (25.2%)	32 (0.5%)	1521 (25.7%)
Stick = 0	594 (9.9%)	3856 (64.4%)	4450 (74.3%)
Total	2103 (35.1%)	3888 (64.9%)	5991 (100%)

The whole sample included valid data for 33 597 individuals, out of whom 28.2% absolutely believe in heaven and 21.8% absolutely believe in hell. These percentages are smaller for European countries and higher for European Catholic ones. The cross-distribution demonstrates that not everybody who believes (disbelieves) in after-life rewards automatically believes (disbelieves) in after-life punishment. Around 21% believe in both (25.2% in the European Catholic countries), whereas 71.2% (64.4% in the European Catholic countries) do not believe (definitely) neither in the carrot nor in the stick.

Belief in heaven is more common than belief in hell, leading to a sub-set of 7% of individuals (9.9% in the European Catholic countries) who believe in heaven but not in hell. We do not have many observations for the 'only punishment' case, i.e., for those who believe in hell but not in heaven (196, 143 and 32 individuals respectively).[16]

Appendix Table A2 presents descriptive statistics on the various variables employed in the regression analysis.

The next section explores the effect of incentives on church-attendance and on praying, as reflected by the religious practice equations.

Religious-practice estimation results

Ordered Logit regression was used to estimate religious practice equations. The dependent variables are church attendance (6 ordered values) and prayer (11 ordered values).

A comparison of the results for the three sets of countries will help to answer the question of whether the effects of the carrot/stick on religious practice are religion-specific or whether they are more universal and not dependent on the religious make-up of the country under discussion. Regressions were run separately for females and males as is common in the literature (see Brañas-Garza & Neuman, 2004). For each case, the list of independent variables included our two core variables that relate to incentives (positive or negative); the dummy variables for an intensively practicing father/mother/respondent at age 12; self-reported religiosity; the set of socio-demographic variables and country-specific variables (see the previous section).

Table 2 presents the coefficients of the two core variables for each Ordered Logit equation, namely, church attendance and prayer. Two versions were used in order to contribute to the robustness of the results:

[16]Appendix Table A1 presents parallel figures that relate to the broader definitions of carrot/stick, so that believers are defined as also those who say that they 'probably believe'. The categories of believers obviously grow (52.5% believe in the carrot/heaven and 41% believe in the stick/hell). However, the mixed categories do not change dramatically: here too only 0.6% believe in hell but not in heaven (identical to the figure in Table 1) and 12.1% believe in heaven but not in hell (compared to 7% when the stricter definition is used in Table 1).

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Table 2. Ordered logit religious practice regressions, carrot/stick variables, 1998

	Whole sample				European countries				European Catholic countries			
	Attendance		Prayer		Attendance		Prayer		Attendance		Prayer	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Equations A												
Carrot (heaven)	0.622	0.560	0.869	0.710	0.805	0.608	0.915	0.744	0.835	0.671	0.690	0.488
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stick (hell)	0.221	0.099	0.361	0.210	0.200	0.241	0.228	0.179	0.006	−0.015	0.202	0.163
	(0.008)	(0.127)	(0.000)	(0.001)	(0.040)	(0.002)	(0.012)	(0.011)	(0.972)	(0.910)	(0.172)	(0.141)
Equations B												
No carrot	−0.497	−0.487	−0.980	−0.838	−0.564	−0.477	−1.057	−0.881	−0.600	−0.680	−1.027	−0.724
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
No stick	−0.167	−0.085	−0.025	−0.069	−0.139	−0.119	0.089	0.026	−0.284	−0.072	0.266	−0.145
	(0.017)	(0.123)	(0.705)	(0.190)	(0.067)	(0.045)	(0.229)	(0.646)	(0.085)	(0.586)	(0.062)	(0.215)
Sample size	11 022	12 979	11 651	13 503	8741	10 608	9268	11 081	1998	2591	2246	2725

Notes:
(a) Significance (*p*-values) in parentheses. (b) Sample sizes are smaller in church attendance equations, due to more missing values of the dependent variable.

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The top part of the table (Equations A) presents coefficients of the variables that relate to absolute belief in heaven/hell, while the bottom part (Equation B) reports the coefficient for the alternative version that relates to the effect of the absolute disbelief variables. The effects are expected to be reversed and if the carrot and stick have differential effects on religious performance, it is expected to be reflected in the two versions.

The full regressions (Type A) that also include the coefficients of the control variables are presented in Appendix Tables A3–A5, and are briefly described below. The coefficients of the control variables in the Type B version were very similar.

The results are impressive. Examining the results for the whole sample we see that

- First, *afterlife beliefs have a major effect on religious practice*. Both the positive (heaven/carrot) and the negative (hell/stick) incentives have significant positive effects on the two variants of religious practice. Belief in heaven and in hell increases participation in mass services and increases prayer habits, while disbelief has the opposite effect.
- Second, *the effect of the carrot (heaven) is much more pronounced than the effect of the stick (hell).* For both the church attendance and the prayer equations and within both the male and the female samples, the coefficient of belief in heaven is approximately three times larger than the coefficient of belief in hell. This is true for the dummy variables that reflect absolute beliefs and also for those that relate to the absolute lack of beliefs.[17] These empirical findings clearly indicate that anticipated rewards have a much more pronounced effect on religious practice than expected penalties.
- Third, there seem to be *gender differences*, mainly regarding the effect of belief (disbelief) in heaven: the *effect is larger for men.* Gender differences are even more obvious when prayer is examined. It appears that although absolute belief in heaven is less common among men (percentages of 24.6 and 31.4 for men and women, respectively, within the whole sample), after-life incentives play a more pronounced role in shaping men's religious behaviour.
- Fourth, in order to control for individual religious heterogeneity (that is correlated with belief/disbelief in heaven/hell and obviously affects religious behaviour), self-reported level of religiosity is used as an additional explanatory control variable (see tables A3–A5). The effects of the carrot/stick that are reported in Table 2 are therefore *net* effects *on top of the effect of religiosity level*.
- Fifth, in order to deal more explicitly with the sub-group of respondents who believe in the 'stay in grave' alternative, the regression analysis was repeated for a more restricted sample that excluded those individuals who reported that they do not believe in the after-life.[18] The core results did not change (available upon request).

Results are very similar when the sample is restricted to the European countries. The differences in the effects of the carrot seem to grow larger within the European sample, especially for church attendance of men. Interestingly, within the sample of European Catholic countries, both the carrot and the stick have smaller effects on prayer. Moreover, the effect of 'hell' (stick) is not significant.[19]

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[17]Beliefs (disbeliefs) in heaven and in hell are highly correlated, leading to multicollinearity. Multicollinearity could result in insignificance of one or two of the correlated variables. However, all coefficients are significant in the equations for the whole sample and the European sample. The problem of multicollinearity is eliminated if interaction terms between beliefs in heaven and hell are introduced instead of the two main-effects variables (see below). The basic results did not change. Additionally, we run three measures of multicollinearity: *Tolerance, variance inflation factor* and *the condition number.* All of them support the absence of multicollinearity. Moreover, as one of the referee notes, the stability of the results over various sub-samples is a good argument in our favour.

[18]Individuals who claimed that they 'do not belief in heaven' and 'do not belief in hell' and 'do not believe in after-life' were removed from the sample. The sample decreased by about 20%.

[19]The insignificance could result from multicollinearity that is more pronounced in the Catholic sample. Regressions that included only the 'hell' variable resulted in a significant coefficient, e.g. in the church attendance equations: The coefficient of 'hell' in the male regression that included 'hell' only was 0.706 ($p = 0.000$), compared to a coefficient of 0.827 ($p = 0.000$) in the equation that included 'heaven' only. The respective coefficients for 'hell' and 'heaven' in the female regressions were: 0.515 ($p = 0.000$) and 0.652 ($p = 0.000$).

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We also experimented with the introduction of interaction terms between definite belief in heaven and hell, instead of the two variables employed in the regressions presented in Table 2 Three interaction terms were included:

- *Definite belief in both heaven and hell* = 1.
- *Definite belief in heaven but not in hell* = 1.
- *Definite belief in hell and not in heaven* = 1.

The reference group was therefore: Believes neither in heaven nor in hell. The results were similar.

For instance, analysing the whole male sample, the estimation of church attendance equations leads to the following estimates of the three coefficients: (i) Coefficient of 1.13 ($p < 0.001$) for belief in both the carrot and stick; (ii) belief in heaven but not hell results in a coefficient of 0.70 ($p < 0.001$) and (iii) belief only in hell but not heaven, leads to an insignificant coefficient of -1.158 ($p = 0.074$).

This version as well clearly shows that the two after-life incentives have a significant effect on the respondent's intensity of church attendance. However, the carrot has a much more pronounced impact compared to the stick. The use of the three interaction terms also solves the problem of correlation between belief in heaven and hell (leading to multicollinearity). However, the introduction of only the two primary variables (definite belief in heaven and definite belief in hell) results in a more compact exposition and was preferred (results of regressions of the 'interaction variables' version can be obtained from the authors).

To conclude, we illustrated that incentives have a major effect on religious behaviour and that positive incentives have a much stronger effect than negative ones, when both are available. This result is basically similar to that proposed in the cooperation experiments described in Andreoni et al. (2003), where carrots (only) were much more effective than sticks (only). However, we do not find their multiplicative 'carrot-stick' effect since we observe that the added value of punishment is really poor.

Appendix Tables A3 (full sample), A4 (European sample) and A5 (European Catholic sample) present the full type A regressions, including the coefficients of the independent variables that were used as controls. Results of the control independent variables are very similar in equations of type B.

As it is evident from Appendix Tables A3–A5, exposure to religious intensive church attendance during the formative years of childhood (indicated by an intensively practicing father, mother and the respondent at the age of 12) affects positively the respondents' religious performance as adults. Male respondents followed much more closely the father than the mother, in the three samples (for instance, in the Catholic sample, the coefficients of the attendance equation are 0.664 and 0.245 for the father and mother, respectively).

Interestingly, prayer habits of women are affected mainly by the mother. The effect of the father is insignificant within all samples. The father has a significant effect on men's prayer habits (the effect of the mother is insignificant, for a significant level 5% or less).

As expected, the importance of religion in the subject's life (expressed by the self-reported level of religiosity, ranging from 'extremely religious' to 'extremely non-religious') is positively and significantly related to religious activity. Religious level seems to have a stronger effect on prayer habits than on church-attendance (within the European Catholic countries the effects on church-attendance and on prayer are similar) probably because church-attendance has also networking motives while prayer has mainly religious motives.

As expected, a spouse who is not affiliated with any religion has a pronounced negative effect on the intensity of religious practice of the partner. Marital status has a significant effect: Married individuals tend to go more frequently to church and married females tend to pray less (for males the coefficient of marital status is insignificant in the prayer equations). However, within the Catholic countries, the coefficient for 'married' is significant only for church attendance of men. The number of household members seems to affect positively religious performance. Larger families exhibit higher levels of church attendance and praying. In this case too, the Catholics behave a bit differently: Only men's church-going is affected by the household size.

Religious practice (both church attendance and prayer) increases with age, in particular, after the respondent reaches the age of 60 (significant coefficients in all regressions). The effects on prayer are more

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pronounced. We observe gender differences in the effect of age, with women exhibiting a more constant and monotonic age-related growth in religious practice.

More educated men tend to participate in church activities more often than their less educated counterparts. The positive effect of education is less pronounced for women, probably because educated men enjoy the networking effects of the church more than women. The effect of education on prayer is less obvious and for women it seems to be negative.

Further discussion: National effects

Respondents who live in more religious countries are practicing more intensively both in relation to church-going and prayer.

The country per capita GDP variable is significant in several of the regressions but does not show a clear pattern as a predictor of religious performance: In some cases it is positive, in some negative and in others insignificant.

In order to dwell a bit deeper into the relationship between the country's level of development (as expressed by per capita GDP) and its religiosity, as expressed in the percentage of true absolute believers in heaven/hell, we ranked the countries included in the dataset by per capita GDP (from lowest—The Philippines—with US$905; to the highest—Norway—with US$37 931; per capita GDP figures are for 1998, expressed in US$ in constant prices for 2000) and plotted per capita GDP against the percentage of absolute believers. Figure 1 presents the bar-diagram for belief in heaven.

As is evident from the diagram, there is no clear pattern. A very similar chart is obtained for per capita GDP versus belief in hell. These descriptive findings do not support the hypothesis that is presented in Hull and Bold (1994). They use a supply-side theory and claim that religious reward and punishment are most effective in cultures with an *intermediate level of development*. It follows that it is expected to find the highest levels of belief in heaven/hell in countries with intermediate per capita GDP. It is clear from Figure 1 that this is not the pattern we observe in 1998. The highest percentages of believers are found at the two tails of the distribution (in the Philippines, Chile and the United States) rather than in its middle part. If the examination is restricted to European countries only, we do find some tendency of more intensity of belief in heaven within countries that belong to the intermediate levels of per capita GDP.

The ISSP 1998 data presented above is also not in line with the predictions of Guiso, Sapienza, and Zingales (2003) who suggested that religious beliefs affect positively economic performance of individuals and consequently the country's development level. As is evident from Figure 1, there is no clear correlation between belief in heaven and economic success: The Philippines, which exhibits the highest rates of belief in

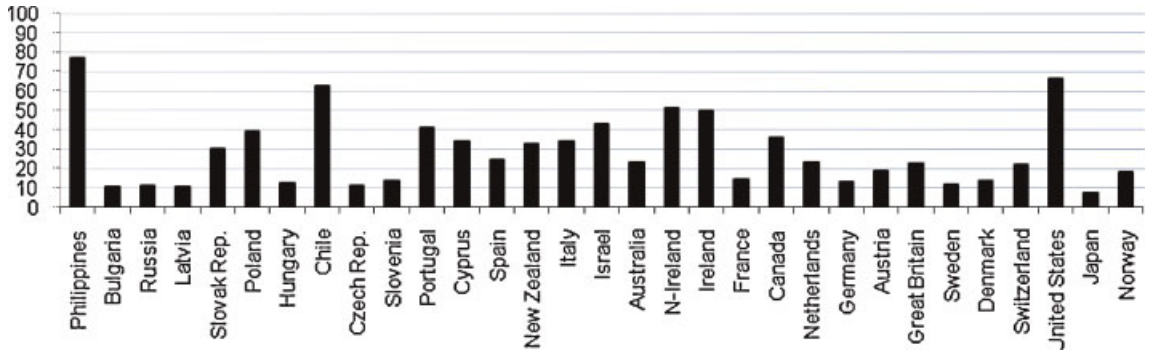


Figure 1. Percentage of absolute believers in heaven, by country (sorted by per capita GDP), 1998

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after-life, has the lowest per capita GDP, while several of the countries with the highest per capita GDP levels have extremely low percentages of believers in after-life (e.g. Japan, Sweden and Denmark).

CONCLUDING REMARKS

This study employs valid data of more than 35 000 personal records from 32 countries to explore the effect of high-stakes incentives (eternal rewards and penalties) on religious performance. The regression analysis shows that beliefs are relevant in religious performance and that when both positive (heaven) and negative (hell) incentives are available, the former are much more effective than the latter. These findings are confirmed for the full sample that includes various religions, and also for the two more homogeneous sub-samples of European countries and of five predominantly European Catholic countries.

In order to arrive at net effects of the incentives stemming from the carrot (heaven) and stick (hell) and to further explore the determinants of religious practice, the analysis also included a series of personal socio-demographic variables (education, age, marital status, etc.). Self-reported religiosity and exposure to religious practice during the formative years of childhood were used as explanatory variables (mother/father/child at 12 were practicing intensively, as reflected by, weekly or more frequent, church attendance). Additionally, national characteristics (religious and economic performance) were also included in order to control for country differences. All in all, we found that definite beliefs in heaven and hell are crucial motivations behind religious activity. Belief in heaven has a major effect and belief in hell lags behind, with a secondary effect.

The very special nature of the incentive system and of the database analysed in this paper leads to several salient implications:

- Our basic results seem to be similar for the religions represented in the dataset and *not religion-specific*. This is indicated by the very similar results that were obtained from the repeated statistical analyses within: (i) A heterogeneous sample that consists of about 33 000 respondents affiliated with diverse religions; then (ii) for a more homogeneous sample of predominantly Christian European countries and finally (iii) for the very homogeneous European Catholic sub-sample.[20]
- This study contributes to the literature on high-stakes incentives by presenting a 'case study' with colossal incentives: Eternal bliss or eternal damnation. Although high-stakes incentives were used in several experiments (see Levitt & List, 2007 for a review), the use of infinite/enormous incentives is not possible within the lab or in field experiments. The very rich and broad ISSP dataset made this examination feasible and led to the finding that in face of extremely high incentives, the positive ones (carrots) are much more effective than the negative ones (sticks).

Two interesting related questions could be explored in future research:

- Are heaven and hell representing *same-sized* gain and loss? The finding that heaven is more effective than hell in promoting religious behaviour, led us to the conjecture that in face of major after-life reward and punishment, individuals are not loss-averse and are more pronouncedly affected by the reward. This conclusion is based on the pre-assumption that heaven and hell represent same-sized deviations from the

[20]However, the results might be different for religions that have completely different after-life systems such as Taoism, Hinduism, Buddhism, etc. To give an example from Buddhism: After an individual dies, he is reborn and the place of his rebirth is determined by his Karma. One's thoughts feelings and actions in previous lives determine where he might be reborn. However, there is no external God/s deciding what will happen and no devil advocating punishment. It is a simple cause and effect system. Furthermore, while the notion of heaven and hell worlds does exist—meaning, one might be reborn in a heaven or hell world—they are not eternal and one will, at some point, be reborn in other realms, including the human one. Moreover, heaven and hell are not the most common continuation of life—but rather extreme possibilities. It is most likely to be reborn again without going through heaven of hell. It follows that when the ISSP questionnaire was completed by Japanese respondents they probably referred to a different notion of heaven/hell.

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base-line of 'dead and in grave' and therefore have the same (reversed) stakes (see p. 8). If this is not the case, and for many individuals heaven and hell do not have the same-sized (opposite) magnitudes then the conclusion becomes more complex. A perception of hell as more powerful than heaven increases the robustness of the assertion that there is evidence for behaviour that is *not* risk-averse: A more powerful negative incentive has a smaller effect than a positive inferior incentive. However, if heaven is perceived as the larger incentive, then the increased size of the positive incentive might be responsible for its larger effect on religious behaviour.

- What are the *discount rates* of the future reward in heaven and the future punishment in hell? In most experiments that examined high-stakes incentives the benefits were immediate (e.g. electroshocks in Berns, Capra, Moore, & Noussair, 2007) and discounting was therefore irrelevant. However, heaven/hell relate to a *postponed* carrot/stick. After-life incentives are naturally subject to substantial unknown delay and are discounted by the decision-maker to their present net values. Is the individual using the same discount rate for both? This question too is relevant for the interpretation of the much stronger effect of belief in heaven as evidence for higher effectiveness of rewards compared to penalty. This interpretation assumes the same sizes and the same discounting rates. An alternative interpretation can be embedded in the possibly differential discounting of rewards and punishments: If the discount rate of hell is larger than the discount rate of heaven, then even if both are perceived as same-sized reward and punishment, the net discounted value of hell is smaller, leading to a lesser effect on religious performance. Discount rates of heaven and hell are unknown and cannot be extracted from our data. Future research could try and look into this interesting question.

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APPENDIX

Table A1. Cross-distributions of the number (percentage) of believers/non-believers in the stick (hell) and carrot (heaven), using the broader definition of belief/non-belief, 1998

Whole sample	Carrot = 1	Carrot = 0	Total
Stick = 1	13 585 (40.4%)	194 (0.6%)	13 779 (41.0%)
Stick = 0	4057 (12.1%)	15 761 (46.9%)	19 818 (59.0%)
Total	17 642 (52.5%)	15 955 (47.4%)	33 597 (100%)
European countries			
Stick = 1	9660 (36.8%)	160 (0.6%)	9820 (37.4%)
Stick = 0	3197 (12.2%)	13 231 (50.4%)	16 428 (62.6%)
Total	12 857 (49.0%)	13 391 (51.0%)	26 248 (100%)
Catholic countries			
Stick = 1	3131 (52.3%)	25 (0.4%)	3156 (52.7%)
Stick = 0	881 (14.7%)	1954 (32.6%)	2835 (47.3%)
Total	4012 (67.0%)	1979 (33.0%)	5991 (100%)

The individual was defined as a believer in the carrot (carrot = 1)/stick (stick = 1), if he chose the categories of 'yes, definitely' or 'yes, probably'.

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Table A2. Descriptive statistics of regression variables

	All countries	European countries	European Catholic countries
Dependent variables			
Respondent's attendance at church services (%)			
Never	28.7	27.9	11.6
Once a year	18.7	19.5	9.6
2–3 times a year	19.8	20.7	21.9
Once a month	5.5	5.5	5.6
2–3 times a month	7.9	7.9	13.0
At least once a week	19.4	18.5	38.3
Respondent's frequency of praying at home (%)			
Never	26.8	28.7	10.5
Once a year	4.4	4.6	2.7
Twice a year	6.4	6.0	4.2
Few times a year	10.0	10.3	10
About once a month	3.6	3.7	3.1
2–3 times a month	4.3	4.4	4.6
Almost every week	4.7	5.0	7.0
Every week	5.5	5.5	11.4
Several times a week	8.9	9.0	17.1
Once a day	16.5	15.6	20.5
Several times a day	8.9	7.2	8.8
Independent variables			
Definitely believes in heaven (%)	29.7	25.2	38.8
Definitely believes in hell (%)	23.0	18.8	28.4
Childhood experience (%)			
Father attended church services intensively	33.4	31.8	56.8
Mother attended church services intensively	41.8	41.7	71.3
Respondent attended church services intensively (At 12)	47.0	47.4	80.2
Self-reported religiosity (%)			
Extremely religious	2.9	2.3	2.6
Very religious	12.7	12.5	17.0
Somewhat religious	36.9	36.7	54.8
Neither religious nor non-religious	21.0	22.1	11.4
Somewhat non-religious	10.7	10.8	9.8
Very non-religious	8.9	8.7	2.4
Extremely non-religious	6.9	6.9	2.0
Marital variables			
Married (%)	61.3	60.8	63.7
Married, spouse has no religion (%)	8.3	8.4	1.9
Number of people in house	3.2 (1.7)	3.1 (1.6)	3.4 (1.6)

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Table A2. (Continued)

	All countries	European countries	European Catholic countries
Age in years (%)			
60 and over	21.5	22.8	27.1
46–59	22.0	21.9	22.1
31–45	31.2	30.6	27.3
30 and under	25.3	24.7	23.5
Education: Last school attended (%)			
Academic	40.5	38.8	36.9
High School	39.7	39.7	29.3
Elementary school	19.8	21.3	33.8
Sample size	24 001	19 349	4589

Notes: (a) Standard deviations in parentheses. (b) Averages of personal characteristics were calculated using the samples that have been employed for the estimation of church-attendance equations. The samples used for estimation of prayer equations were somewhat larger (due to less missing values). The average characteristics were however very similar. The samples used for Table 1 were even larger (observations with missing values of the socio-economic variables were not excluded) and as a result the figures for definite believers in heaven/health are somewhat different from those reported in Table 1. (c) In the questionnaires distributed in Israel and Bulgaria, the questions on church attendance were more detailed and included nine categories (compared to six categories in all other countries), probably due to the different religious requirements in Judaism and in the Christian Orthodox denomination. It was, however, possible to combine categories of the more detailed version and bring them down to the same six of the others. (d) The averages of the country-specific variables are the following: (i) Per capita GDP (in 1998, expressed in US$, in 2000 constant prices): 15 656 (SD = 10 962) within the whole sample; 14 759 (SD = 10 516) in the European countries; 13 144 (SD = 5561) in the Catholic countries; (ii) country average of church attendance in 1998 (ranges between 1 and 6): 2.1 (SD = 0.8) within the full sample; 2.0 (SD = 0.8) in the European countries; 3.1 (SD = 0.6) in the Catholic countries and (iii) country average prayer habits (ranges between 1 and 11): 5.4 (SD = 1.5) within the full sample; 5.2 (SD = 1.4) in the European countries; 6.7 (SD = 0.9) in the Catholic countries.

Table A3. Ordered logit religious practice regressions, whole sample, 1998

	Attendance		Prayer	
	Male	Female	Male	Female
Carrot (absolutely believes in Heaven)	0.622 (0.000)	0.561 (0.000)	0.869 (0.000)	0.710 (0.000)
Stick (absolutely believes in Hell)	0.221 (0.008)	0.099 (0.127)	0.361 (0.000)	0.210 (0.001)
Childhood experience				
Father attended church services intensively	0.372 (0.000)	0.165 (0.001)	0.295 (0.000)	−0.064 (0.185)
Mother attended church services intensively	0.277 (0.000)	0.459 (0.000)	0.075 (0.182)	0.160 (0.002)
Respondent attended church intensively (at 12)	0.285 (0.000)	0.394 (0.000)	0.366 (0.000)	0.478 (0.000)
Self-reported religiosity				
Extremely religious	3.743 (0.000)	4.006 (0.000)	5.154 (0.000)	5.304 (0.000)
Very religious	3.703 (0.000)	3.736 (0.000)	5.162 (0.000)	4.908 (0.000)
Somewhat religious	2.809 (0.000)	2.875 (0.000)	4.035 (0.000)	3.990 (0.000)
Neither religious nor non-religious	1.831 (0.000)	1.940 (0.000)	2.768 (0.000)	2.728 (0.000)
Somewhat non-religious	1.334 (0.000)	1.381 (0.000)	2.107 (0.000)	1.964 (0.000)
Very non-religious	0.602 (0.000)	0.648 (0.000)	0.959 (0.000)	1.045 (0.000)
Extremely non-religious	Ref.	Ref.	Ref.	Ref.
Marital variables				
Married	0.334 (0.000)	0.141 (0.000)	−0.059 (0.196)	−0.121 (0.001)
Married and spouse has no religion	−1.145 (0.000)	−0.773 (0.000)	−0.550 (0.000)	−0.400 (0.000)
Number of people in household	0.045 (0.000)	0.027 (0.023)	0.076 (0.000)	0.048 (0.000)
Age (years)				
60 and over	0.328 (0.000)	0.610 (0.000)	0.523 (0.000)	0.760 (0.000)
46–59	−0.021 (0.725)	0.290 (0.000)	0.179 (0.003)	0.409 (0.000)
31–45	−0.033 (0.546)	0.191 (0.000)	0.114 (0.033)	0.166 (0.000)
30 and under	Ref.	Ref.	Ref.	Ref.

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Table A3. (Continued)

	Attendance		Prayer	
	Male	Female	Male	Female
Education (last school attended)				
Academic	0.421 (0.000)	0.092 (0.062)	0.252 (0.000)	−0.121 (0.011)
High school	0.209 (0.000)	−0.021 (0.659)	0.148 (0.005)	−0.128 (0.005)
Elementary school	Ref.	Ref.	Ref.	Ref.
Country-specific characteristics				
Per capita GDP (divided by 1000)	0.011 (0.000)	0.001 (0.451)	0.016 (0.000)	0.004 (0.013)
National average (attendance/prayer)	0.567 (0.000)	0.618 (0.000)	0.270 (0.000)	0.279 (0.000)
Sample size	11,022	12,979	11,651	13,503
Pseudo-R^2	0.200	0.194	0.205	0.185

Significance (p-values) in parentheses.

Table A4. Ordered logit religious practice regressions, European countries, 1998

	Attendance		Prayer	
	Male	Female	Male	Female
Carrot (absolutely believes in Heaven)	0.805 (0.000)	0.608 (0.000)	0.915 (0.000)	0.744 (0.000)
Stick (absolutely believes in Hell)	0.200 (0.040)	0.241 (0.002)	0.288 (0.012)	0.179 (0.011)
Childhood experience				
Father attended church services intensively	0.550 (0.000)	0.454 (0.000)	0.230 (0.000)	−0.023 (0.672)
Mother attended church services intensively	0.150 (0.024)	0.319 (0.000)	0.121 (0.066)	0.162 (0.005)
Respondent attended church intensively (at 12)	0.311 (0.000)	0.275 (0.000)	0.546 (0.000)	0.538 (0.000)
Self-reported religiosity				
Extremely religious	3.622 (0.000)	4.025 (0.000)	5.648 (0.000)	5.474 (0.000)
Very religious	3.708 (0.000)	3.840 (0.000)	5.618 (0.000)	5.140 (0.000)
Somewhat religious	2.950 (0.000)	3.011 (0.000)	4.500 (0.000)	4.301 (0.000)
Neither religious nor non-religious	1.898 (0.000)	2.076 (0.000)	3.204 (0.000)	3.036 (0.000)
Somewhat non-religious	1.369 (0.000)	1.456 (0.000)	2.427 (0.000)	2.188 (0.000)
Very non-religious	0.686 (0.000)	0.798 (0.000)	1.298 (0.000)	1.266 (0.000)
Marital variables				
Married	0.312 (0.000)	0.149 (0.000)	−0.076 (0.153)	−0.107 (0.009)
Married and spouse has no religion	−1.371 (0.000)	−0.977 (0.000)	−0.928 (0.000)	−0.627 (0.000)
Number of people in household	0.043 (0.006)	0.039 (0.005)	0.036 (0.019)	0.033 (0.016)
Age (years)				
60 or over	0.271 (0.000)	0.611 (0.000)	0.471 (0.000)	0.708 (0.000)
46–59	−0.079 (0.257)	0.282 (0.000)	0.160 (0.022)	0.388 (0.000)
31–45	−0.082 (0.185)	0.192 (0.000)	0.105 (0.090)	0.162 (0.001)
30 and under	Ref.	Ref.	Ref.	Ref.
Education (last school attended)				
Academic	0.397 (0.000)	0.127 (0.018)	0.238 (0.000)	−0.160 (0.002)
High school	0.238 (0.000)	0.025 (0.627)	0.138 (0.018)	−0.177 (0.000)
Elementary school	Ref.	Ref.	Ref.	Ref.
Country-specific characteristics				
Per capita GDP (divided by 1000)	0.014 (0.000)	0.003 (0.060)	0.010 (0.000)	−0.006 (0.002)
National average (attendance/prayer)	0.642 (0.000)	0.691 (0.000)	0.215 (0.000)	0.246 (0.000)
Sample size	8741	10 608	9268	11 081
Pseudo-R^2	0.210	0.203	0.208	0.186

Significance (p-values) in parentheses.

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Table A5. Ordered logit regressions, European Catholic countries, 1998

	Attendance		Prayer	
	Male	Female	Male	Female
Carrot (absolutely believes in heaven)	0.835 (0.000)	0.671 (0.000)	0.690 (0.000)	0.488 (0.000)
Stick (absolutely believes in hell)	0.006 (0.972)	−0.015 (0.910)	0.201 (0.172)	0.163 (0.141)
Childhood experience				
Father attended church services intensively	0.664 (0.000)	0.440 (0.000)	0.354 (0.002)	0.027 (0.788)
Mother attended church services intensively	0.245 (0.058)	0.499 (0.000)	0.247 (0.052)	0.179 (0.108)
Respondent attended church intensively (at 12)	0.549 (0.000)	0.543 (0.000)	0.804 (0.000)	0.647 (0.000)
Self-reported religiosity				
Extremely religious	4.089 (0.000)	4.643 (0.000)	4.497 (0.000)	4.654 (0.000)
Very religious	4.194 (0.000)	4.521 (0.000)	4.960 (0.000)	4.276 (0.000)
Somewhat religious	3.736 (0.000)	3.950 (0.000)	4.024 (0.000)	3.644 (0.000)
Neither religious nor non-religious	2.444 (0.000)	2.849 (0.000)	3.009 (0.000)	2.632 (0.000)
Somewhat non-religious	2.013 (0.000)	2.470 (0.000)	2.241 (0.000)	2.175 (0.000)
Very non-religious	1.410 (0.002)	1.445 (0.004)	0.325 (0.406)	0.371 (0.346)
Marital variables				
Married	0.237 (0.040)	0.060 (0.503)	−0.063 (0.544)	−0.063 (0.430)
Married and spouse has no religion	−1.779 (0.001)	−0.873 (0.000)	−1.017 (0.011)	−0.339 (0.116)
Number of people in household	0.074 (0.017)	0.022 (0.413)	0.044 (0.114)	0.027 (0.268)
Age (years)				
60 and over	1.045 (0.000)	1.093 (0.000)	0.960 (0.000)	1.057 (0.000)
46–59	0.350 (0.022)	0.555 (0.000)	0.492 (0.000)	0.635 (0.000)
31–45	0.219 (0.106)	0.445 (0.000)	0.382 (0.003)	0.192 (0.068)
30 and under	Ref.	Ref.	Ref.	Ref.
Education (last school attended)				
Academic	0.457 (0.000)	−0.019 (0.845)	0.412 (0.000)	−0.190 (0.035)
High School	0.365 (0.002)	0.114 (0.282)	0.172 (0.101)	−0.280 (0.003)
Elementary	Ref.	Ref.	Ref.	Ref.
Country-specific characteristics				
Per capita GDP (divided by 1000)	0.028 (0.001)	0.012 (0.112)	−0.004 (0.579)	−0.055 (0.000)
National average (attendance/prayer)	0.873 (0.000)	0.740 (0.000)	0.321 (0.000)	0.181 (0.000)
Sample size	1,998	2,591	2,246	2,725
Pseudo-R^2	0.194	0.169	0.178	0.122

Significance (p-values) in parentheses.

Table A6. Ordered logit regressions, whole sample, 1998 (broader definitions of belief in heaven/hell)

	Attendance		Prayer	
	Male	Female	Male	Female
Believes in Carrot (heaven)	0.424	0.402	0.987	0.717
(Definitely or probably)	(0.000)	(0.000)	(0.000)	(0.000)
Believes in Stick (hell)	0.268	0.185	0.248	0.288
(Definitely or probably)	(0.000)	(0.000)	(0.000)	(0.000)
Childhood experience				
Father attended church services intensively	0.394 (0.000)	0.182 (0.000)	0.302 (0.000)	−0.046 (0.336)
Mother attended church services intensively	0.259 (0.000)	0.468 (0.000)	0.042 (0.461)	0.164 (0.002)
Respondent attended church intensively (at 12)	0.281 (0.000)	0.378 (0.000)	0.362 (0.000)	0.459 (0.000)

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Table A6. (Continued)

	Attendance		Prayer	
	Male	Female	Male	Female
Self-reported religiosity				
Extremely religious	3.763 (0.000)	3.992 (0.000)	5.033 (0.000)	5.180 (0.000)
Very religious	3.649 (0.000)	3.668 (0.000)	4.957 (0.000)	4.724 (0.000)
Somewhat religious	2.639 (0.000)	2.727 (0.000)	3.720 (0.000)	3.724 (0.000)
Neither religious nor non-religious	1.726 (0.000)	1.852 (0.000)	2.583 (0.000)	2.580 (0.000)
Somewhat non-religious	1.267 (0.000)	1.328 (0.000)	2.002 (0.000)	1.870 (0.000)
Very non-religious	0.582 (0.000)	0.627 (0.000)	0.907 (0.000)	0.999 (0.000)
Marital variables				
Married	0.328 (0.000)	0.140 (0.000)	−0.063 (0.171)	−0.123 (0.001)
Married and spouse has no religion	−1.152 (0.000)	−0.758 (0.000)	−0.541 (0.000)	−0.364 (0.000)
Number of people in household	0.053 (0.000)	0.031 (0.009)	0.084 (0.000)	0.049 (0.000)
Age (in years)				
60 or above	0.358 (0.000)	0.633 (0.000)	0.581 (0.000)	0.809 (0.000)
46–59	0.009 (0.874)	0.322 (0.000)	0.240 (0.000)	0.472 (0.000)
31–45	−0.022 (0.681)	0.207 (0.000)	0.140 (0.010)	0.199 (0.000)
30 or under	Ref.	Ref.	Ref.	Ref.
Education (last school attended)				
Academic	0.414 (0.000)	0.097 (0.049)	0.251 (0.000)	−0.095 (0.046)
High School	0.190 (0.000)	−0.024 (0.617)	0.115 (0.029)	−0.126 (0.006)
Elementary	Ref.	Ref.	Ref.	Ref.
Country-specific characteristics				
Per capita GDP (divided by 1000)	0.011 (0.000)	0.001 (0.385)	0.015 (0.000)	0.003 (0.033)
National average (attendance/prayer)	0.556 (0.000)	0.625 (0.000)	0.255 (0.000)	0.279 (0.000)
Sample size	11,022	12,979	11,651	13,503
Pseudo-R^2	0.198	0.193	0.208	0.186

Significance (p-values) in parentheses.

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