DISCUSSION PAPER SERIES

IZA DP No. 3287

The Big Carrot: High Stake Incentives Revisited

Pablo Brañas-Garza
Teresa García-Muñoz
Shoshana Neuman

January 2008

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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Pablo Brañas-Garza
Universidad de Granada

Teresa García-Muñoz
Universidad de Granada

Shoshana Neuman
Bar-Ilan University, CEPR and IZA

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

IZA Discussion Paper No. 3287
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ABSTRACT

The Big Carrot: High Stake Incentives Revisited*

This paper provides an empirical demonstration of high stakes incentives in relation to religious practice. It shows that, when both positive (carrot) and negative (stick) 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).

JEL Classification: C91, D64, Z13

Keywords: carrot/stick, high stakes, rewards, punishment, economics of religion

Corresponding author:

Shoshana Neuman
Department of Economics
Bar-Ilan University
52900 Ramat-Gan
Israel
Email: neumans@mail.biu.ac.il

* Pablo Brañas-Garza and Teresa García-Muñoz acknowledge financial support from DGCYT (SEJ2007-62081/ECON).

The Big Carrot: High Stake Incentives Revisited

> *"Heaven rewards desirable behavior and hell increases the expected cost of misbehavior, causing an increase in enforcement effectiveness"* (Hull and Bold, 1994, p. 449).

1 Motivation

Very recently, three salient topics have increased interest in the role of incentives in economic decisions: the loss aversion theory (e.g. Tversky and Kahneman, 1991); the effectiveness of punishment (vs. rewards) in experimental settings[2] (Andreoni et al. 2003, Nikoforakis, 2008); and how results may vary when incentives are substantially larger – high stakes incentives (Slonim and Roth, 1998).

This paper provides an empirical example of high stakes incentives, using more than 18 thousand personal observations. It demonstrates that the effectiveness of punishment, when rewards are also available, is small. Thus, our data do not provide evidence in favour of the loss aversion theory.

Our 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 and Neuman, 2004). Church attendance and prayer are both measures of religious practice that, obviously, might be affected by incentives.

In addition to a number of socio-demographic independent variables (age, education, etc.) we also introduced two dummies: ($carrot_i$=1) if the i*th* individual absolutely believes in heaven and ($stick_i$=1)[3] if he absolutely believes in hell[4]. Alternatively, in order to explore

[2] There is a vast literature regarding these issues —see the references in Andreoni et al. (2003). 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.

[3] The carrot/stick terminology arises from Andreoni et al. (2003).

[4] The studies of Barro & McCleary (2003) or Torgler (2006) are excellent examples of the importance of religious beliefs on economic behaviour.

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 ($no\ carrot_i$ =1) or in hell ($no\ stick_i$ =1). It was found that the effect of the carrot (heaven) is more than twice 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 double the effect of the lack of belief in the existence of hell.
To conclude, in the presence of the largest possible stakes (infinitum rewards)[5], rewards (carrots) are more effective than punishment in encouraging religious practice.

2 Data, variables and definitions

We used a unique rich database that was collected in 1998 under the International Social Survey Program: Religion II, supported by UNESCO. The survey was conducted in 28 countries[6]. Two questions included in this dataset were used to define the two dependent variables:

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

[5] Recall Pascal's argument (extracted from "Pensées"):
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).

[6] Germany, Great Britain, Northern Ireland, The United States, Austria, Hungary, Italy, Ireland, The Netherlands, Norway, Sweden, The Czech Republic, Slovenia, Poland, Russia, New Zealand, Canada, The Philippines, Japan, Spain, Latvia, The Slovak Republic, France, Cyprus, Portugal, Chile, Denmark, Switzerland.

- *Prayer*$_i$: is based on the question “How often do you pray?” that has eleven alternative categories: never (1); once a year (2); twice a year (3); few times a year (4); once a month (5); two or three times a month (6); almost every week (7); every week (8); several times a week (9); once a day (10); several times a day (11). Here too, prayer obligations vary between religions (e.g., Jews need to pray 3 times a day; Moslems 5 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 these estimations, the equations have a non-linear form; both the sign and the size of the coefficients are easily comparable but can not be readily interpreted (see Branas-Garza and Neuman, 2004, for more on Ordered Logit estimation of religious practice equations). For each case (church-attendance and praying equations) we used the following list of independent variables:

1) *Dummy variables related to beliefs in heaven and in hell*. These are our core variables and they arise from the following original dataset variables:
   - *Heaven*$_i$: is based on the question: “Do you believe in heaven?” that has four options: yes, definitely (1); yes, probably (2); no, probably not (3); no, definitely not (4).
   - *Hell*$_i$: is based on the question: “Do you believe in hell?” that has the same four options: yes, definitely (1); yes, probably (2); no, probably not (3); no, definitely not (4).

   Using the latter two questions, the following dummy variables were defined:
   - *Carrot*$_i$ that takes the value of 1 if *Heaven*$_i$ = 1 (that is, the respondent definitely believes in heaven) and 0 otherwise.
   - *Stick*$_i$ = 1 if *Hell*$_i$ = 1 (the respondent definitely believes in hell) and 0 otherwise.

   Two additional dummy variables were defined in order to repeat the analysis in the opposite direction:
   - *No carrot*$_i$ = 1 if *Heaven*$_i$ = 4 (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).

In sum, we focused on those subjects who completely believe in heaven and/or hell and on those who do not believe at all. Note that both heaven and hell are personal and non-transferable 'commodities'. For the former, the size of the premium and the penalty should be "*infinitum*"; whereas for the latter, there is no incentive attached to their decision regarding how much to practice religious behaviour.

2) The list of *socio-demographic variables* included: age (*over 60*$_i$ =1); education (*academic education [full or partial]*$_i$ =1); marital status (*married*$_i$ =1; *spouse has no religion*$_i$ =1); and family size (*number of people in household*$_i$).
3) We also controlled for country specific variables: the *Pluralism Index*[7]; and the *country average of church-attendance* (in church-attendance equations) and *of prayer* (in prayer equations).

Table 1 presents the cross-distribution of the four stick/carrot options[8]. Three parallel cross-distributions are shown: for the whole sample (all the countries included in the survey); for European countries; and for predominantly Catholic countries (Spain, Italy, Ireland, Portugal and Poland). The estimation of church attendance and prayer equations will also be repeated for these three sets of countries. The European countries are mostly Christian and the Catholic countries are composed of an even more homogenous population that is predominantly Catholic. 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[9].

[7] The P index represents religious pluralism and is defined as P=1-HHI, where HHI is the Herfindahl-Hirschman Index of concentration, defined as the sum of squares of the shares of the country's religious denominations. The HHI is borrowed from industrial organization where it serves as a measure of the competitiveness of an industry. In an industry with a single monopolistic producer, HHI will equal 1. If the industry is composed of n firms of equal size, then HHI = 1/n and as the number of firms is increasing, HHI is approaching 0. It follows that P ranges between 0 (single denomination) and 1 (infinite number of denominations). The larger is P, the more religiously diverse is the country (see also Lieberson, 1969 and Voas et al., 2002 who referred to the same diversity/pluralism index).

[8] Given that subjects may believe (or not) in heaven and/or in hell, this creates a 2x2 factorial design.

[9] The religious homogeneity of the populations (in European countries and mainly in 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

Table 1: Cross-Distributions of the Number (Percentage) of Believers/Non-believers in the Stick and Carrot

Whole sample	*Carrot=1*	*Carrot=0*	Total
Stick=1	4,063 (21.6%)	113 (0.6%)	4,176 (22.2%)
Stick=0	1,469 (7.8%)	13,194 (70.0%)	14,663 (77.8%)
Total	5,532 (29.4%)	13,307 (70.6%)	18,839 (100%)
European countries	*Carrot=1*	*Carrot=0*	Total
Stick=1	2,952 (18.5%)	89 (0.6%)	3,041 (19.0%)
Stick=0	1,169 (7.3%)	11,754 (73.6%)	12,923 (81.0%)
Total	4,121 (25.8%)	11,843 (74.2%)	15,964 (100%)
Catholic countries	*Carrot=1*	*Carrot=0*	Total
Stick=1	999 (26.9%)	21 (0.6%)	1,020 (27.5%)
Stick=0	410 (11.0%)	2,283 (61.5%)	2,693 (72.5%)
Total	1,409 (37.9%)	2,304 (62.1%)	3,713 (100%)

The whole sample included 18,839 individuals, out of which 29.4% absolutely believe in heaven and 22.2% 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 20% believe in both (27% in the Catholic countries), whereas about 70% (61% in the Catholic countries) believe neither in the carrot nor in the stick. Belief in heaven is more common than belief in hell, leading to a sub-set of about 8% of individuals (7% in the European countries and 11% in the 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 (113, 89 and 21 individuals respectively)[10].

'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.

[10] In this regard our treatments are very similar to those provided by Andreoni et al. (2003) but we do not have their "pure stick treatment".

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

3 Religious-practice estimation results

Ordered Logit regression was used to estimate religious practice equations. The dependent variables are church attendance (six ordered values) and prayer (eleven ordered values). 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) and the set of socio-demographic variables.

Table 2 presents the coefficients of the two core variables for each Ordered Logit equation, namely, church attendance and prayer. The top part of the table shows the equations (type A) which use the dummies for absolute beliefs in heaven/hell. The bottom part (type B) explores the opposed case, using dummies that reflect the complete lack of beliefs in heaven/hell. The full regressions that also include the coefficients of the control variables are presented in Appendix Tables A1, A2 and A3 and briefly described below.

Table 2: Ordered Logit Religious Practice Regressions, Carrot/Stick Variables, 1998

	Whole Sample				European Countries				Catholic Countries			
	ATTENDANCE		PRAYER		ATTENDANCE		PRAYER		ATTENDANCE		PRAYER	
Equations A	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Carrot (Heaven)	1.158	0.985	1.517	1.153	1.302	0.996	1.604	1.158	1.104	0.941	1.079	0.543
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)
Stick (Hell)	0.480	0.507	0.432	0.471	0.415	0.593	0.422	0.522	0.232	0.324	0.338	0.549
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.197)	(0.030)	(0.037)	(0.000)
Equations B	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
No carrot	-1.093	-0.865	-1.679	-1.439	-1.156	-0.888	-1.704	-1.440	-1.409	-1.208	-1.638	-1.440
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No stick	-0.367	-0.394	-0.191	-0.295	-0.307	-0.375	-0.171	-0.264	-0.161	-0.228	0.092	-0.332
	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.022)	(0.000)	(0.333)	(0.114)	(0.557)	(0.014)
Sample size	9006	9823	9006	9823	7538	8420	7538	8420	1702	2009	1702	2009

Significance (p values) in parentheses

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

First, *incentives 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 more than twice as large as 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[11]. These empirical findings clearly indicate that anticipated rewards have a much more pronounced effect on religious practice than expected penalties.

Results are very similar when the sample is restricted to the European countries. Interestingly, within the sample of Catholic countries, both the carrot and the stick have smaller effects on religious practice and differences between rewards and punishments are even more pronounced[12]. Moreover, the effect of 'hell' (stick) is not significant in most cases[13].

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[11] 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. Moreover, regressions that included only one of the variables (either the 'heaven' or the 'hell' variable) also indicate that in most cases the effect of 'heaven' is larger (not presented, can be provided upon request)

[12] We do not have a convincing explanation for this empirical finding. Possible speculations are the following: (i) in Catholic countries both the belief in heaven/hell and religious practice (in terms of church attendance and prayer) are common and part of the local religious culture. The two are therefore less correlated in terms of cause and outcome; (ii) in the Catholic denomination there is less emphasize on the direct link between religious practice and the opportunity to reach heaven or hell: what you have to do to reach heaven is undergo *baptism* and either not commit any mortal sins or commit such a sin (as everybody eventually does) but receive the *Sacrament of Penance* before you die. The scale metaphor, of good deeds vs. bad ones where the heavier side determines your fate, as used in Judaism and also in other Christian denominations, is less relevant for Catholics. Therefore, the everyday religious practices, which accumulate as good or bad deeds, are also less important and there is less of an incentive to practice them – it is easy to avoid the stick.

[13] 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 1.173 (p=0.000), compared to a coefficient of 1.271 (p=0.000) in the equation that included 'heaven' only. The respective coefficients for 'hell' and 'heaven' in the female regressions were: 1.079 (p=0.000) and 1.168 (p=0.000).

Appendix Tables A1 (full sample), A2 (European sample) and A3 (Catholic sample) present the full type A regressions, including the coefficients of the independent variables that are used as controls. Table A3 does not include the P Index, because it is irrelevant when only Catholic countries are considered. Results of the control independent variables are very similar in equations of type B. As is evident from Appendix Tables A1, A2 and A3, a spouse with no religion has a pronounced negative effect on the intensity of religious practice, while all other explanatory variables (pluralism index; national average of practice; number of people in household; academic education; and age above 60 years) have positive effects on religious behaviour. The two major positive factors are those of age (that also reflects cohort effects) and of the religious make-up of the country. However, the effects of the carrot are more pronounced than those of the personal characteristics.

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. [14]

The following figures show the cumulative distributions of attendance and prayer for the 3 relevant sub-samples defined in table 1.

Figure 1a: Church Attendance, Whole Sample

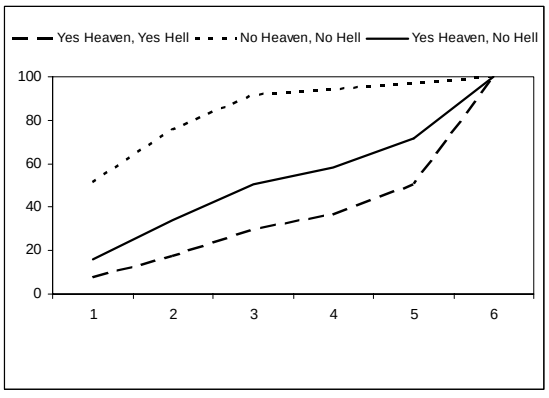
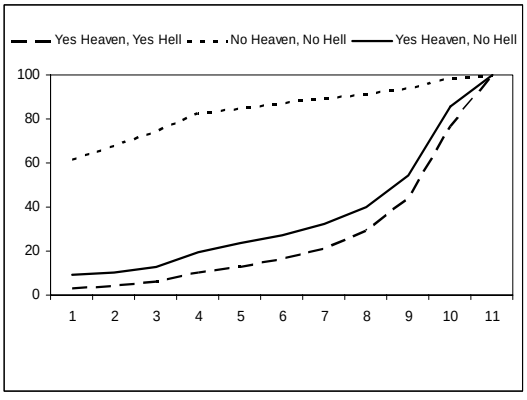


Figure 1b: Prayer, Whole Sample



[14] Also note that Andreoni et al. (2003) found that the effect of 'sticks' does not dependent on the presence/absence of 'carrots', while 'carrots' are more effective in the absence of 'sticks'.

Figure 2a: Church Attendance, Europe

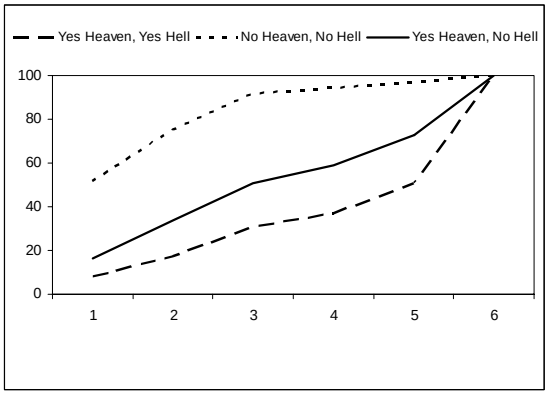


Figure 2b: Prayer. Europe

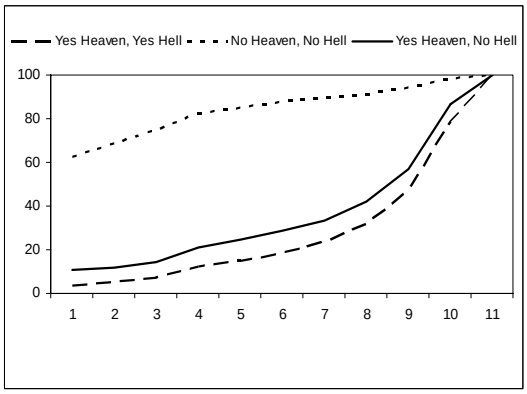


Figure 3a: Church Attendance, Cath. Countries

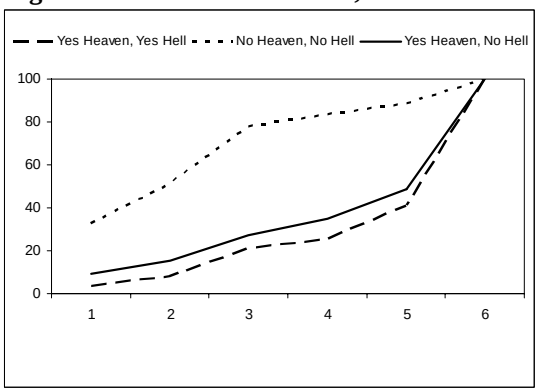
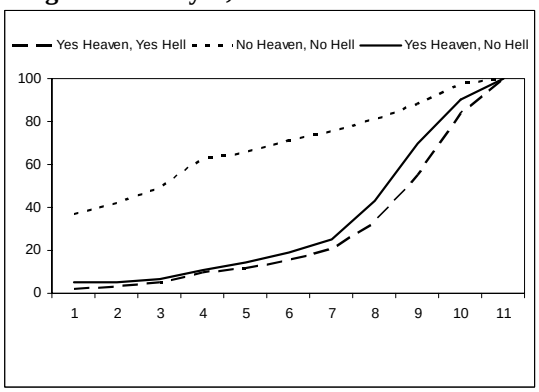


Figure 3b: Prayer, Cath. Countries



For both church attendance and prayer it was found that the "No Heaven, No Hell" (no carrot – no stick) stochastically dominates the "Yes Heaven, Yes Hell" (carrot – stick) cumulative distribution; moreover, the “No Heaven, No Hell” stochastically dominates the ”Yes Heaven, No Hell” (carrot but no-stick) distribution, and the latter, dominates the “Yes Heaven, Yes Hell” (carrot-stick) distribution [15].

[15] The Kolmogorov-Smirnov test indicates whether the distribution of a variable is the same in two independent samples. We used this test, rather than a parametric one, because it deals with the comparison of distribution functions. Using the Kolmogorov-Smirnov test, we find that: (i) carrot-stick effects [Yes/Yes] are different from carrot (no stick) [Yes/No] incentives (except in catholic countries for the church-attendance distribution) (ii) carrot-no stick effects [Yes/No] are different from no carrot (no stick) [No/No] case for church-attendance and praying respectively. In next table are presented statistics and significance of the tests.

		Whole Sample	*European Countries*	*Catholic Countries*
		Yes Heaven, No Hell	Yes Heaven, No Hell	Yes Heaven, No Hell
Church attendance	Yes Heaven, Yes Hell	4.911 (0.000)	4.530 (0.000)	0.974 (0.299)
	No Heaven, No Hell	9.424 (0.000)	8.711 (0.000)	5.291 (0.000)

Therefore from these figures we may conclude:

1) Positive and negative Incentives have a crucial effect on decisions.
2) The carrot effect is very large while the stick effect is much more reduced[16].

In sum, we see that incentives have crucial effects on decisions regarding religious practice. Our study does support the pronounced effectiveness of positive rewards whereas no large effects are found for punishment.

4 Concluding remarks

This study employs data of more than 18 thousand personal observations to look into high stakes incentives (maximum/infinitum rewards and penalties). The regression analysis and also experimental economics methodologies (stochastic dominance and non-parametric tests) lead to equal conclusions: when both positive (carrot) and negative (stick) incentives are available, the former are more effective than the latter.

Two salient implications arise from this study:

- Experimental results regarding the effectiveness of punishment (vs. rewards) are not supported by our large data set where high stakes are at work.
- The loss aversion theory is not confirmed, within a large sample, under high stakes scenarios.

These two core results are relevant for the literature and, therefore, justify a new research agenda.

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Prayer	Yes Heaven, Yes Hell	2.456 (0.000)	2.145 (0.000)	1.581 (0.013)
	No Heaven, No Hell	14.126 (0.000)	12.907 (0.000)	5.456 (0.000)

[16] We got this result from the comparison between the net carrot-stick effect [Yes/Yes − No/No] vs. the net carrot (no stick) effect [Yes/No− No/No]. We see that [Yes/Yes − No/No]>> [Yes/No− No/No].

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APPENDIX TABLES

Table A1. Ordered Logit Regressions, Whole Sample, 1998

	ATTENDANCE		PRAYER	
	Male	Female	Male	Female
Carrot (*Heaven*)	1.158	0.985	1.517	1.153
	(0.000)	(0.000)	(0.000)	(0.000)
Stick (*Hell*)	0.480	0.507	0.432	0.471
	(0.000)	(0.000)	(0.000)	(0.000)
Pluralism Index	0.094	0.334	0.514	0.427
	(0.285)	(0.000)	(0.000)	(0.000)
National average	0.744	0.906	0.377	0.350
(attendance/prayer)	(0.000)	(0.000)	(0.000)	(0.000)
People in household	0.042	0.046	0.061	0.030
	(0.004)	(0.001)	(0.000)	(0.025)
Married	0.190	0.177	-0.009	0.138
	(0.004)	(0.001)	(0.892)	(0.009)
Spouse has no	-1.705	-1.329	-1.468	-1.230
religion	(0.000)	(0.000)	(0.000)	(0.000)
Academic education	0.303	0.114	0.183	-0.096
(full or partial)	(0.000)	(0.017)	(0.000)	(0.014)
Age (above 60)	0.516	0.762	0.572	0.793
	(0.000)	(0.000)	(0.000)	(0.000)
Sample size	9006	9823	9006	9823

Significance (p values) in parentheses

Table A2. Ordered Logit Regressions, European Countries, 1998

	ATTENDANCE		PRAYER	
	Male	Female	Male	Female
Carrot (*Heaven*)	1.302	0.996	1.604	1.158
	(0.000)	(0.000)	(0.000)	(0.000)
Stick (*Hell*)	0.415	0.593	0.422	0.522
	(0.000)	(0.000)	(0.000)	(0.000)
Pluralism Index	0.156	0.582	0.492	0.418
	(0.126)	(0.000)	(0.000)	(0.000)
National average	0.868	1.023	0.365	0.372
(attendance/prayer)	(0.000)	(0.000)	(0.000)	(0.000)
People in household	0.031	0.042	0.035	0.038
	(0.062)	(0.008)	(0.034)	(0.015)
Married	0.157	0.170	0.060	0.122
	(0.021)	(0.003)	(0.371)	(0.026)
Spouse has no	-1.810	-1.386	-1.753	-1.303
religion	(0.000)	(0.000)	(0.000)	(0.000)
Academic education	0.274	0.112	0.100	-0.110
(full or partial)	(0.000)	(0.037)	(0.058)	(0.034)
Age (Above 60)	0.459	0.759	0.535	0.822
	(0.000)	(0.000)	(0.000)	(0.000)
Sample size	7538	8420	7538	8420

Significance (p values) in parentheses

Table A3. Ordered Logit Regressions, Catholic Countries, 1998

	ATTENDANCE		PRAYER	
	Male	Female	Male	Female
Carrot (*Heaven*)	1.104	0.941	1.079	0.543
	(0.000)	(0.000)	(0.000)	(0.000)
Stick (*Hell*)	0.232	0.324	0.338	0.549
	(0.197)	(0.030)	(0.037)	(0.000)
National average	1.147	1.168	0.407	0.257
(attendance/prayer)	(0.000)	(0.000)	(0.000)	(0.000)
People in household	0.097	0.037	0.098	0.032
	(0.005)	(0.262)	(0.003)	(0.278)
Married	0.272	-0.109	0.089	0.197
	(0.147)	(0.487)	(0.620)	(0.152)
Spouse has no	-1.775	-1.299	-1.955	-0.805
religion	(0.000)	(0.000)	(0.000)	(0.000)
Academic education	0.477	-0.192	0.419	-0.348
(full or partial)	(0.001)	(0.172)	(0.001)	(0.008)
Age (Above 60)	0.929	0.969	0.819	0.873
	(0.000)	(0.000)	(0.000)	(0.000)
Sample size	1702	2009	1702	2009

Significance (p values) in parentheses