

# Liberty, Equality, Religiosity<sup>1</sup>

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## Abstract

In this paper we study the role of religiosity in political choices such as redistribution and individual liberties. To a standard model with consumption and effort, we add a third good: civil liberties with a cap established by law. More liberties, like divorce, abortion, gender parity, or gay marriage, may be considered good by the secular and detrimental by the religious individuals. With standard assumptions on individual preferences, one obtains that wider liberties increase the marginal utility of consumption to seculars, and decrease it to religious individuals. Labor supply and income are therefore lower for religious individuals in the presence of liberties. This implies a higher share of religious agents among the poor, consistent with evidence that the poor care more about "moral values". We analyze the preferences of individuals over taxation and the legal cap over liberties. We show that restriction of liberties can arise as an equilibrium outcome of a simple political process when society is sufficiently religious. Moreover, if economic polarisation is lower than religious polarisation, restriction of liberties results in lower taxation. Thus more religious societies will impose lower taxation both because (i) their productivity is lower, (ii) repression of liberties is more likely to arise and result in lower taxes.

JEL-Classification: Key-words: Religiosity, Redistribution, Individual Liberties, Political Economy.

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## 1 Introduction

In this paper we study the role of religiosity in political choices such as redistribution and individual liberties. Individuals differ in their degree of religiosity –ranging from fully secular to fully religious– and in their productivity. Because of the different valuation of individual liberties, religiosity has a direct effect on the individual choice of effort. We study individual preferences over government policies concerning redistribution and caps on liberties and characterise the outcome of majority voting.

To a standard model where individuals have preferences over consumption and effort, we add a third (public) good: civil liberties. The main difference with the other two goods is that more liberties may be considered good by some and detrimental by others. Divorce, abortion, gender parity, gay marriage or euthanasia are examples of the kind of liberties we have in mind. Typically the different religions prohibit the use of these liberties or a subset of them.<sup>3</sup> How much these prohibitions are internalized by individuals depends on their degree of religiosity. Secular individuals may welcome more of such liberties while religious individuals may reject them. Therefore individual valuation of liberties, and hence the preferences for the other goods too, depends on the degree of religiosity/secularism of each person, which we consider exogenously given.

Together with the prohibition of the use of certain individual liberties, there is a second feature that seems to be common to all religions. This is that religiosity is often associated with low appreciation of material goods. Many religions advocate modesty and puritanism, as exemplified by monks in both Christianity and Eastern religions.<sup>4</sup> In our model, the low appreciation for material consumption associated with religiosity derives from a standard assumption on individual preferences. We assume that the utility function has positive cross derivatives, so that the marginal utility of consumption increases with the valuation of civil liberties and with leisure. In our model this is the reason why religious people

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<sup>3</sup>More generally, one can think also of standard goods such as consumption of alcohol or of various types of foods as goods that are restricted by religions.

<sup>4</sup>By way of illustration, we bring forward the following quotes from religious sources against materialism. In the New Testament, Matthew 16:26: “What profit would there be for one to gain the whole world and forfeit his soul?” In the Jewish Book of Proverbs 28:6: “Better is the poor that walketh in his uprightness, than he that is perverse in his ways, though he be rich”. In Islam, Masnavi Book 4 Story 2: “Quit thy wealth, even if it be the realm of Saba; Thou wilt find many realms not of this earth. What thou callest a throne is only a prison”, and in Hindu, Bhagavad Gita 18:37-38: “That which is like nectar in the beginning from the connection of the sense-object with the senses, but is as poison in the end, is held to be of 'passion'.”

give low value to material consumption: their religiosity makes them dislike civil liberties, which renders material consumption less enjoyable. These effects will be the more pronounced the more religious the individual is. Therefore, in contrast with the Weberian tradition and in line with empirical evidence, we focus on intensity of religiosity rather than on differential behaviour caused by different affiliations.<sup>5</sup>

Our assumed influence of religiosity on individual preferences implies that wider liberties increase the marginal utility of consumption to seculars, and decrease it to religious individuals. Consequently, for a fixed maximum level of individual liberties allowed by the law, labor supply and hence income will decrease with religiosity.<sup>6</sup> This negative relation is steeper the higher the level of liberties afforded. Thus there will be more religious among the poor, consistent with the observation that the poor care about “moral values”.<sup>7</sup> In our model, the “moral values” dimension of preferences, often analyzed in the literature, is not orthogonal to income but actually correlated with income as religiosity causes poverty.

Our model implies then that per capita income is positively related to secularism.<sup>8</sup> Specifically, per capita income increases

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<sup>5</sup>Clark and Lelkes (2005), Lehrer (1995), Darnell and Sherkat (1997), all obtain- empirically- that the intensity of religiosity matters much more than differences in affiliation. Also Brañas-Garza et al (2013) conduct an experiment of dictator and ultimatum games with a sample of 766 adults and find that religious intensity (measured by active attendance of church services) matters above and beyond denomination.

<sup>6</sup>This is in line with Barro and Mcleary (2003) who show that religious societies (with higher participation in rituals) exhibit lower GDP, although they also show that beliefs in heaven and hell increase output. Becker and Woessman (2009) show that income increases when religious attendance decreases. Protestants lead to better outcomes possibly through education. Clark and Lelkes (2005) find that religiosity has a negative effect on labor supply —most specially of women— and that religious unemployed are less active in looking for a job. Moreover, in line with our model, they find a differential behaviour depending on whether the own religiosity punishes or not divorce. See also Berman (2000) and his study of Orthodox Jews. Lehrer (1995) also finds a negative effect of religiosity on female labor participation. The results by Campante and Yanagizawa-Drott (2013) show that longer Ramadan fasting has a negative effect on output growth in Muslim countries. More interestingly, their empirical evidence shows that Ramadan affects Muslims’ relative preferences for work, suggesting that the mechanism operates at least partly by changing beliefs and values that influence labor supply and occupational choices beyond the month of Ramadan itself. On the other hand, Guiso, Sapienza and Zingales (2003) show that on average, religious beliefs are associated with “good” economic attitudes, where “good” is defined as conducive to higher per capita income and growth.

<sup>7</sup>See De La O and Roden (2008). These moral values are typically “family values” or values that are associated with conservative ideology.

<sup>8</sup>This conclusion can arise also in other models of religion as for example in Iannaccone (1993) or Levy and Razin (2012) where religious agents devote

with liberties in secular societies and decreases in religious societies. More polarised religiosity or more liberties will increase income inequality, while an increase in the relative size of the secular population yields a more egalitarian distribution and a higher per capita income.

The valuation of liberties has a double side: (i) the personal use of liberties and (ii) the fact that such liberties are accessible to all. The legalisation of divorce allows individuals to terminate unhappy marriages if they wish and the valuation of this specific action depends on one's own degree of religiosity. But, even if one is not going to divorce, the fact that divorce is legal may have an independent effect on the utility of individuals, mediated by their religiosity/secularism. How much weight do individuals assign to the valuation of the private use of liberties versus the valuation that such use is accessible to anyone is a fundamental characteristic of the religious culture of each society. At one extreme we may have for instance the radical interpretations of Islam for whom the main role of the state is to implement the religious norms, Catholicism at the time of the Inquisition, or Jewish beliefs that God may punish all even if only some have sinned. At the other end there might be the forms of Protestantism that essentially focus on the personal relationship with god, quite independent of what the others might be doing.<sup>9</sup>

We show that such socialised aspect of liberties implies that the preferences of the very religious individuals -even though also very poor- may be for low taxation (compared with their secular counterparts). This arises as these individuals prefer to restrict the legal cap on liberties to a minimum. Such restriction of liberties reduces the overall productivity in society (and hence the tax base) and moreover represses income differences between seculars and religious and consequently income inequality. Both these effects imply that these very religious individuals would combine their preferences for minimum liberties with preferences for relatively low taxation, compared with equally poor seculars who prefer wide liberties and relatively high taxation.

In a simple sequential voting model with two religiosity levels and two productivity levels, we show that restriction of liberties along with relatively low taxation is more likely to arise when the socialised aspect of liberties is sufficiently important, and when economic polarisation (e.g., inequality in productivities) is sufficiently low, so that the religious agents are not too divided by class. Thus more religious societies will eventually impose lower

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time to non-productive religious activity such as rituals.

<sup>9</sup>Buddhism too is essentially concerned on the development of one's spirituality rather than on imposing such principles on the entire population.

taxation in our model both because (i) their productivity is lower; (ii) repression of liberties is more likely to arise and result in lower taxes.

Our finding that religious societies may exhibit lower tax rates is consistent with recent empirical findings. Using cross-national survey data, Scheve and Stasavage (2006) argue that religious individuals are more likely to oppose redistribution. De La O and Roden (2008) show that in every country, it is primarily the moral values dimension rather than the economic dimension that pulls religious voters away from the left. Huber and Stanig (2007) show that forced choice on individual liberty issues (so that right-wing parties on economic issues also restrict liberties) leads to more right-wing voting among all income groups, but more so among the poor.<sup>10</sup>

Several theoretical explanations have been suggested for such findings. In Scheve and Stasavage (2006), the psychic benefit from religion allows individuals to cope with bad states which nullifies the need for social insurance and hence more religiosity implies lower taxation.<sup>11</sup> In Benabou and Tirole (2006) religion is a way of manipulating one's beliefs in order to motivate continued effort and therefore religious agents will work harder and demand less taxes.<sup>12</sup> In Huber and Stanig (2011), the rich and the religious poor form electoral coalitions in favor of low taxes; in return the rich provide directed side payments via charity to the religious poor. Our theory differs as it builds both on (i) the pressures of the seculars to redistribute less when there are more religious agents in society as these agents are less productive, and on (ii) the pressures of the religious agents to reduce liberties and as a result to decrease taxation when society becomes less productive but more equal.

Our paper is also related to several theoretical papers that look at the relation between religious restrictions and economic development. A complementary paper is Carvalho and Koyama (2012) who illustrate how religions choose their restrictions strategically to induce labour and capital contributions in the face of exogenous changes to economic development. In our model we look at how the restrictions that religions impose endogenously affect economic development. A recent paper by Benabou, Ticchi and

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<sup>10</sup>See also Palani (2008) and Rees (2009). The causality may also go in the other direction. A more unequal society may cause agents to feel less secure which may lead them to turn to religion as a source of comfort (Rees 2009).

<sup>11</sup>See also Gill and Langaarde (2004).

<sup>12</sup>In Elkin, Goskel and Gurdal (2010), for the religious organizations to work, people need to make financial sacrifices. They would therefore prefer more disposable income (to make it voluntary so to signal better) and thus they prefer less taxes.

Vindigni (2014) looks at how religious censorship might affect innovation and scientific progress and hence total output. In their model religious blocking of knowledge will reduce output (which is somewhat similar to the effect of restriction of liberties on output in our model); religious authorities or the state do so in order to preserve religious preferences and hence redistribution towards religious goods (versus general income redistribution). In their political model they show that a more religious society induces lower taxation as then the winning coalition forms along the religiosity cleavage instead of the class one. In our analysis it is also the case that a religious majority and a low enough economic polarisation induces a winning coalition along religious lines. Such a coalition lowers liberties and consequently income inequality, so that taxes decrease too.

The remainder of the paper is organized as follows. In the next Section we present the model and some preliminary results. Section 3 considers the preferences of individuals over taxes and liberties. In Section 4 we analyze the political determination of these policies. We discuss our findings in Section 5.

In Section 6 we provide some empirical results on the implications of our model for individual preferences. First, we test the implication that effort is negatively related to religiosity and that this effect is amplified by the degree of liberties. Second, we test the implication that income is negatively related to religiosity and that the effect is amplified by the degree of liberties. Our analysis lands support to the predictions of the model.

## 2 The model and preliminary results

Preferences are defined over the three goods: consumption,  $c$ , effort,  $l$ , and civil rights  $\ell \in [\ell_m, \ell_M]$ . We normalise  $\ell_m = 0$  and  $\ell_M \leq 1$ . The maximum liberties accessible  $\ell_M$  is determined by law. We assume that there are no constraints on the free practice of individual liberties within  $[0, \ell_M]$ .

A legal cap on liberties has two effects. First, it establishes the limit to what is accessible to individuals. Second, it also has a social dimension because individuals may like or dislike to be in a society where some liberties are permitted, independently of whether or not they will personally use them. We represent then the effect of liberties on an individual as a convex linear combination of the personal use of them  $\ell$  and the maximum legally permitted  $\ell_M$ ,  $(1 - \alpha)\ell + \alpha\ell_M$ . The parameter  $\alpha \in (0, 1)$  indicates the relative weight of the social dimension of individual liberties.<sup>13</sup>

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<sup>13</sup>It seems also plausible that the value attached to  $\alpha$  depends on the share of the population that effectively chooses to make use of them. This will not qualitatively affect our results.

Religiosity moulds individual preferences.<sup>14</sup> In this model it does it in two (linked) ways. First, while secular individuals positively value the use of the kind of individual liberties we have mentioned, religious individuals do it negatively. Let  $x \in [0, 2]$  be the degree of religiosity. We assume that the valuation of liberties can be written as  $(1 - x)[(1 - \alpha)\ell + \alpha\ell_M]$ . Hence, for a religious person, with  $x > 1$ , the personal use and the mere existence of these rights is psychologically costly, while for a secular, with  $x < 1$ , it is positively valuable. We assume that religiosity is distributed according to the cdf  $G(x)$ . We shall denote by  $x_s$  and  $x_r$  the average religiosity among the secular and the religious individuals, respectively. Let  $\sigma$  be the proportion of seculars in the society,  $\sigma = G(1)$ .

Second, religiosity induces individuals to lower their appreciation for material pleasures and rewards, and the more so the higher the level of religiosity.<sup>15</sup> This second aspect of religiosity directly results from the partial complementarity between liberties and consumption. A higher enjoyment of liberties makes material consumption more enjoyable and the other way around.

We assume that the utility valuation of  $(c, l, \ell)$  is

$$u(c, l, (1 - x)[(1 - \alpha)\ell + \alpha\ell_M]).$$

We make the standard assumption of a positive cross derivative between goods. Note however, that the sign of the cross derivative with respect to  $\ell$ , is positive for secular and negative for religious individuals ( $u_{c\ell} > 0, \forall x \in [0, 1)$  and  $u_{c\ell} < 0, \forall x \in (1, 2]$ ). This implies that higher levels of individual liberties increase the marginal utility of consumption of a secular. The opposite will hold for a religious individual.

To make the problem tractable we shall specify preferences to

$$u(c, l, \ell, x) = c \left[ 1 + (1 - x)[(1 - \alpha)\ell + \alpha\ell_M] \right] - \frac{1}{2}l^2. \quad (1)$$

In this specification of the individual preferences we assume some degree of complementarity between consumption and the enjoyment of liberties, as well as additive separability of effort. This is a standard useful specification of individual preferences where liberties are simply viewed as a consumption “good”.

Besides their level of religiosity, individuals are also characterised by their earning capacity  $w$ , so that pre-tax income will be  $wl$ . The individual earning capacity  $w$  is distributed according to the cdf  $F(\cdot)$ , with expected value  $\bar{w}$  and second moment  $E(w^2)$ .

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<sup>14</sup>As in Guiso et al. (2006).

<sup>15</sup>See Iannaccone (1992).

We assume that religiosity and earning capacity are independently distributed.<sup>16</sup>

Consumption is equal to disposable income. There is a purely redistributive linear income tax with a marginal rate  $t$  and a budget balancing per capita transfer  $T$ , so that,

$$c = (1 - t)wl + T.$$

Let us start with the choice of individual liberties in  $[0, \ell_M]$ . It is immediate that the solution will consist of choosing either  $\ell = \ell_M$  if  $x \leq 1$  or  $\ell = 0$  if  $x > 1$ .<sup>17</sup> Therefore, the individual liberties component will be either  $\ell_M$  for secular individuals or  $\alpha\ell_M$  for religious individuals. Given this, to simplify on notation we will from now on use  $\ell$  for the legal cap  $\ell_M$ .

We now derive the optimal choice of effort supply  $l$ . It is straightforward to obtain from (1) that

$$l = (1 - t)w(1 + (1 - x)\ell) \text{ if } x \leq 1 \text{ and } l = (1 - t)w(1 + (1 - x)\alpha\ell) \text{ if } x > 1. \quad (2)$$

Notice that since the marginal utility of consumption is lower for the religious individuals, they will have less of an incentive for working hard.

**Remark 1** *For the same  $w$ , labor supply is negatively related to religiosity.*

Our assumptions provide an explicit theoretical basis for the negative relationship between religiosity and individual effort that has already been identified by a number of empirical papers.<sup>18</sup> Besides the explicit derivation from fundamentals, the model delivers the new, testable insight that this effect is enhanced by the legal level of individual liberties. This is supported by our own empirical

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<sup>16</sup>At the end of the paper we shall discuss the case of correlation between earning capacity and religiosity.

<sup>17</sup>In order to avoid vacuous complications we assume that the individuals with  $x = 1$  choose maximum liberties.

<sup>18</sup>Besides the empirical findings by Clark and Lelkes (2005), Lehrer (1995), and Campante and Yanagizawa-Drott (2013), already mentioned above, there is other complementary empirical evidence. Darnell and Sherkat (1997) document a strong negative effect of fundamentalism on educational achievement, controlling for other social background variables. Dilmaghani (2012) finds that the level of religiosity [across faiths] is highly significant and with a negative coefficient in explaining hourly wage. Lynn et al (2009) find that in a cross country empirical test [137 countries], there is a positive and strong correlation between atheism and aggregate national IQ. Since they cannot separate between original and acquired IQ via education, it seems natural to read the finding in the reverse and infer that in less religious countries the level of education is higher.



analysis (see Section 6). Note that the above holds also when  $\alpha = 0$  as seculars “consume” liberties while the religious do not.

The effect of religiosity on labor supply has an obvious aggregate implication. Differential religiosity will spread out earned incomes with the low productivity religious individuals obtaining the lowest incomes and the secular with high productivity the highest incomes. Hence, the model implies that individuals have lower incomes because they are religious, not that they are religious because they are poor.

The pre-tax income  $y(w, r, t)$  will thus be

$$y(w, x, t) = (1 - t)w^2[1 + (1 - x)\ell(x)] \quad (3)$$

where  $\ell(x) = \ell$  if  $x < 1$  and  $\alpha\ell$  otherwise.

Note that an increase in the cap on liberties  $\ell$  increases the effort and hence income of the secular and reduces both for religious individuals. Hence:

**Remark 2** *An increase in  $\ell$  increases the dispersion of market incomes.*

We now compute the aggregate output and transfers. For a given  $x$ , aggregating over  $w$  we have

$$y(x, t) = (1 - t)E(w^2)[1 + (1 - x)\ell(x)],$$

and aggregating over  $x$  we obtain the average per capita income

$$\bar{y} = (1 - t)E(w^2) \left\{ 1 + \left[ \sigma(1 - x_s) + (1 - \sigma)(1 - x_r)\alpha \right] \ell \right\}.$$

Define

$$\rho \equiv \sigma(1 - x_s) + (1 - \sigma)(1 - x_r)\alpha. \quad (4)$$

The term  $\rho$  measures the effect of maximum liberties on output and can be interpreted as an aggregate index of social secularism. It attains its maximum when everybody is totally secular and its minimum when all are totally religious and assigning the maximum weight to the publicness factor. Hence,  $\rho \in [-1, 1]$ . In the rest of the paper we shall say that a society is secular (religious) when  $\rho \geq (<) 0$ . Hence, a secular society is one in which liberties have a positive net aggregate effect of enhancing incentives.

Now we can write

$$\bar{y} = (1 - t)E(w^2)[1 + \rho\ell],$$

**Remark 3** *Aggregate output increases with social secularism  $\rho$ . Widening the range of liberties  $\ell$  increases aggregate output in a secular society and reduces it in a religious society.*

The aggregate tax collection –equal to the per capita transfer  $T$ – is

$$T = t\bar{y} = t(1 - t)E(w^2)(1 + \rho\ell).$$

Therefore, the individual disposable income, equal to consumption, is

$$c(w, x, t) = (1 - t)^2 w^2 (1 + (1 - x)\ell(x)) + t(1 - t)E(w^2)(1 + \rho\ell). \quad (5)$$

Individual and aggregate incomes depend on religiosity, both at the personal level and at the aggregate. Notice that even if all individuals started with the same earning capacity  $w$ , differences in religiosity would materialise in inequality of incomes, with the seculars earning more than the religious. We now consider what this implies in terms of their preferences over  $t$  and  $\ell$ .

### 3 Individual preferences over taxes and liberties

We now consider the ideal policies of individuals over the cap  $\ell$  and tax rate  $t$ . Our main result here is that for the same or lower income, religious individuals might prefer lower taxes compared with secular ones. This arises as they may prefer lower level of maximum liberties and their taxation preferences shift accordingly.

Using (5) and rearranging we can compute the indirect utility as (recall that  $\ell(x) = \ell$  if  $x < 1$  and  $\alpha\ell$  otherwise):

$$v_{w,x}(t, \ell) = \frac{1}{2}(1 - t)^2 w^2 [1 + (1 - x)\ell(x)]^2 + t(1 - t)E(w^2)[1 + \rho\ell][1 + (1 - x)\ell(x)]. \quad (6)$$

Using this expression we start by deriving the preferences over taxes for a fixed  $\ell$ , and then we obtain the joint ideal policy  $(\ell, t)$ .

#### 3.1 Preferences over taxes

It will be useful to start with the following result which characterizes preferences over taxes when  $\ell$  is fixed. From (6) it is easy to derive:<sup>19</sup>

**Proposition 4** *For a fixed  $\ell$ , the most preferred tax rate  $t$  by individual  $(w, x)$  is  $t = 0$  for all  $y > \bar{y}$  and  $t(w, x) = \frac{\bar{y} - y}{2\bar{y} - y} \leq \frac{1}{2}$  for  $y \leq \bar{y}$ .*

Note that  $y/\bar{y}$  is independent of  $t$  and thus the expression for  $t(w, x)$  defines a closed-form solution for the desired level of taxation. Hence, for any given  $\ell$ , all individuals with the same income

<sup>19</sup>It is straightforward to derive the first order condition from the indirect utility with respect to  $t$  and to show that it is sufficient.

will prefer the same tax rate, independently of their religiosity and of their productivity.

There is ambiguous evidence on the nexus between religiosity and support for redistribution. The common wisdom that religious individuals are more compassionate and hence more inclined to redistribute from the rich to the poor has been challenged by claims that they might as well consider everyone's fate as god's will and hence be reluctant to intervene, or alternatively, by claims that religion provides a psychic benefit that allows individuals a higher well-being and thus less need for the welfare state.<sup>20</sup> It is evident in many countries that many religious individuals support conservative parties and hence low redistribution.<sup>21</sup> In our model this can arise, as we show below, when we consider the joint preferences over liberties and taxation. Moreover, in our political model this might result from a strategic choice between restriction of liberties and low taxation versus more liberties and more redistribution.

It is worthwhile at this point to pause and examine the effect of change in parameter values on the preferences for taxation. We focus on the following key changes: an increase in the relative size of the secular group,  $\sigma$ , an increase in social role of the cap on liberties  $\alpha$ , and the effect of an increase in the cap  $\ell$ .

As we have seen, the preferred tax depends on the ratio of personal earned income  $y$  to the aggregate per capita income  $\bar{y}$ . Therefore, the effect on the preferred tax rate  $t$  from a change of parameter  $z$ ,  $z = \sigma, \alpha, \ell$  can be written as

$$\frac{dt}{dz} = \frac{y\bar{y}}{[2\bar{y} - y]^2} \left[ \frac{1}{\bar{y}} \frac{\partial \bar{y}}{\partial z} - \frac{1}{y} \frac{\partial y}{\partial z} \right]. \quad (7)$$

Hence, the sign of the effect of a parameter change will have a common component  $\frac{1}{\bar{y}} \frac{\partial \bar{y}}{\partial z}$  and an individual specific component  $\frac{1}{y} \frac{\partial y}{\partial z}$ . Note that all parameters which increase the per capita output will have a positive effect on the preferences for redistribution, while all parameters which increase the individual income (and thus make the individual relatively richer) will have a negative effect on the preferences for redistribution.

**Proposition 5** (i) *An increase in  $\sigma$  increases the preferences for taxation for all individuals.* (ii) *An increase in  $\alpha$  or in liberties  $\ell$  decreases the preferences for taxation for all agents with a sufficiently low  $x$ .*

<sup>20</sup>Clark and Lelkes (2005) find that religious individuals are on the average against job creation to mitigate unemployment, but Brañas-Garza et al (2013) obtain that religiosity is positively related to generosity in dictator and ultimatum games.

<sup>21</sup>See Huber and Stanig (2007).

An increase in the share of seculars increases  $\rho$  and hence the aggregate per capita output  $\bar{y}$ . For all agents this means higher tax revenues (while their own output remains the same) and thus the preference for taxation increases.

An increase in  $\alpha$  though has two effects: it decreases the per capita output, but also decreases the individual output of the religious agents. Seculars (all those with  $x < 1$ ) will surely then prefer lower taxation, as not only the tax base decreases, but they also become relatively richer due to the second effect. Moderately religious agents whose individual output will only be mildly affected will therefore also support a decrease in taxation, while the very religious agents will become relatively poorer and thus prefer higher taxes.

The effect of a change in liberties has a similar flavour. If liberties reduce the per capita output (when  $\rho < 0$ ), then as they also reduce the individual output of the religious and enhance that of the seculars, all seculars and the mildly religious will prefer lower taxation while the very religious will prefer higher taxation. If liberties enhance the per capita output (when  $\rho > 0$ ), then due to the individual effect all the religious would prefer higher taxation. The seculars on the other hand face conflicting incentives as both the per capita and their own individual output increase. If they are sufficiently secular they become relatively richer compared with the new mean output and thus prefer lower taxation.

### 3.2 Preferences over taxes and liberties

We now proceed to examine the joint preferences over liberties and taxes. Bearing in mind that for seculars  $x < 1$  and for religious  $x > 1$ , it is straightforward from (6) that for any fixed  $t$  all secular individuals prefer maximum liberties in a secular society (with  $\rho \geq 0$ ), whereas all religious individuals prefer full repression of liberties in a religious society ( $\rho \leq 0$ ). In these cases, their individual labour incentives coincide with the aggregate labour incentives. But in other cases the trade-off between liberties and taxes becomes more complex. To simplify, let us focus on the case of  $\rho > 0$ , which implies that increasing the cap on liberties increases aggregate output. This, by (6), immediately implies that all secular agents have an ideal policy of  $\ell = 1$ . Let us assume also that the choice over the cap on liberties is between full repression or full freedom, that is  $\ell = \{0, 1\}$ .

**Proposition 6** *There exists  $x(w) \geq 1$ , with  $x(w) = 1$  for a sufficiently high  $w$  and  $x(w) > 1$  and  $\frac{\partial x(w)}{\partial w} < 0$  otherwise, such that all individuals  $(w, x)$  with  $x \leq x(w)$  prefer  $\ell = 1$  and  $t$  as defined in Proposition 4, and all individuals  $(w, x)$  with  $x > x(w)$  prefer  $\ell = 0$*

and  $t$  as defined in Proposition 4.

**Proof:** see Appendix.

In order to have an intuition for this result, consider first the case in which religiosity is completely private, so that  $\alpha = 0$ . In this case the utility of the religious individuals is not affected by the cap on individual liberties, while it keeps being a work incentive for the seculars. Hence, an increase in liberties will increase per capita income and consequently also the disposable income of the religious individuals, thanks to the increased transfer. The ideal policy of all individuals will consist of  $\ell = 1$ , and the  $t$  that is optimal for their income.

Consider now the case in which  $\alpha > 0$ . The previous argument continues to apply for secular individuals (as  $\rho > 0$ ). As for religious individuals, increased liberties have an ambivalent effect. The increase in output and transfers has to be weighed against the loss in own incentives because of the negative valuation of the social component of liberties. Those with a sufficiently high earning capacity would be rich enough and would prefer no redistribution at all. For them, restricting liberties would not be costly but only beneficial. For the poorer individuals, if they are not too religious (that is, when  $x < x(w)$ ), the net effect of liberties will still be positive. Once they become more religious though, the negative effect of liberties becomes sufficiently important and they prefer to ban them altogether.

Our result says that there is a threshold level of religiosity  $x(w)$ , such that for each given  $w$ , the religious individual will be indifferent between the two extreme levels of liberties (each associated with its optimal level of taxation). The lower is the earning capacity the more important it is to increase the received transfer and hence the higher the level of religiosity that would make such individuals indifferent. Hence the negative relationship between the threshold level of religiosity and earning capacity.

An important implication of Proposition 6, is that due to their preferences for less liberties, religious individuals might also prefer lower taxes compared with their secular counterparts. The preference for taxation by religious individuals turns out to be non-monotonic in their level of religiosity:

**Corollary 7** *Preferences over taxation are (weakly) non-monotonic in religiosity. Thus, for the same level of productivity  $w$ , some religious individuals may prefer lower taxes than do secular individuals.*

The key point is that as individuals become more religious their preferences for liberties switch to full repression. But, by Proposi-

tion 5, this implies that their preferences for taxation jump downwards: when  $\rho > 0$ , lower liberties implies less aggregate output (and thus lower benefit from taxation) together with higher individual output for the religious resulting in lower inequality. Hence, sufficiently religious individuals end up supporting low redistribution because they strongly prefer less liberties. Note that the discontinuity that arises from the extreme form of liberties we consider is not important; even if we allow for all  $\ell \in [0, 1]$ , the very religious would choose very low liberties and thus lower taxation.

This result is consistent with some empirical data showing that religious individuals who are also poor often prefer low taxes compared with their secular counterparts.<sup>22</sup> In our model religious individuals with the same level of productivity as some seculars, are actually poorer than them given some status quo level of tax and liberties. But they will prefer lower taxes than the seculars do. Because of the social content of the preferences for liberties, such individuals prefer their suppression. As lower levels of liberties reduce the aggregate output and interpersonal inequality, their demand for taxation falls.

We next turn to the political determination of liberties and taxation. We will show that a similar effect can arise when we allow for strategic political choices.

## 4 Voting over redistribution and liberties

In this Section we examine the political choice over the two policies: liberties and taxation. We consider a simple political model with sequential voting, first on the cap  $\ell$  and then on  $t$ . The particular sequence of voting does not affect the results. It seems realistic though to think that decisions on individual liberties are taken less frequently and are more likely to be part of constitutions compared with the almost “daily” political conflict over redistribution.

We first present a simplified model that will permit us to gain intuition about the determinants of the political outcome. Then we focus on the case in which religiosity is the deeper social cleavage. We end this section by providing the main results for the general case, which we study fully in the appendix.

### 4.1 The role of religious and economic polarisation

We consider a society with two productivity levels, low and high, and with two levels of religiosity, secular and religious. The ratio between the two productivities will measure the degree of *economic polarisation* and the ratio of religiosities will measure *re-*

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<sup>22</sup>See Huber and Stanig (2007) and De La O and Roden (2008).

*religious polarisation*. Four groups are obtained as a result of the crossing of two productivity levels,  $w_h$  and  $w_l$ , and two religiosity levels,  $x_s < 1 < x_r$ . The four groups are then the religious high-productivity agents ( $rh$ ), secular high-productivity agents ( $sh$ ), religious low-productivity agents ( $rl$ ) and secular low-productivity agents ( $sl$ ). We shall refer to  $\frac{w_h^2}{w_l^2}$  as the “economic polarisation” and to  $\frac{1+(1-x_s)}{1+(1-x_r)\alpha}$  as the “religious polarisation”.

Denote the share of the low productive agents in the economy by  $p$ , and as before denote the share of the secular agents by  $\sigma$ . We focus on the case in which  $p > \frac{1}{2}$ , and where no single group has a majority. We continue to assume that the cap on liberties has to be either of the two extremes,  $\ell \in \{0, 1\}$ ,<sup>23</sup> and consider the more interesting case of  $\rho > 0$ .

In our model religiosity will affect redistribution in two different ways. For fixed level of liberties, it may reduce or increase redistribution through its effect on individual effort and hence income inequality. For example, when a religious coalition determines taxes (which arises when religious polarisation is relatively high), taxes will increase in religiosity as the coalition would demand more transfers.<sup>24</sup> But sufficient religiosity will also result in repression of liberties. This implies then lower taxes as income inequality decreases with repression. Thus, taxes may be a non-monotonic function of religiosity. Taxes may increase in religiosity as long as liberties are allowed and then decrease along with repression of liberties.

The next subsection explores the conditions for the above to occur.

## 4.2 The non-monotonic effect of religiosity on taxation

As a first, and significant, exercise we consider the case of a society in which religiosity is the deeper social cleavage, with religious polarisation exceeding economic polarisation, so that  $\frac{1+(1-x_s)}{1+(1-x_r)\alpha} > \frac{w_h^2}{w_l^2}$ , while economic polarisation is relatively low. Therefore, as the cap on social liberties  $\ell$  rises, most of the income inequality will be generated by the differential incentive to work linked to the religious polarisation. We shall find that as religiosity increases, the majoritarian tax will increase first, but after a point the religious majority will impose a cut on liberties together with low taxation.

<sup>23</sup>Our results hold qualitatively if we look at a cap in  $[0, 1]$  and not just the two extremes.

<sup>24</sup>On the other hand, when the seculars determine taxation, an increase in religiosity will decrease taxes as society becomes less productive while the seculars become relatively richer.

We solve the problem backwards. First we obtain which would be the majoritarian tax rate for either level of liberties and, given this outcome, we derive the majoritarian policy towards liberties.

We consider first the case with  $\ell = 0$ . In this case religiosity plays no role. Agents in society differ along the economic cleavage only. The tax is determined by the preferences of the low productive group(s), but will be relatively low given that economic polarisation is small. By Proposition 4 we therefore have that

$$t_0 = \frac{E(w^2) - w_l^2}{2E(w^2) - w_l^2}. \quad (8)$$

Consider now what happens under full liberties  $\ell = 1$ . Since the high-productive secular *sh* group is the richest, and the low-productive religious group *rl* is the poorest, the ideal policies of these groups will not be candidates for the median tax. We therefore concentrate instead on the middle income groups *sl* and *rh*. Note that as religious polarisation is the dominant one and hence the incentive differential is maximal, the *sl* will be richer than the *rh* and will therefore favour lower taxation than the *rh*. As both secular groups are richer, we should expect the taxes to be determined by coalitions along the religious cleavage.

The ideal tax for the *sl* group will be substantially lower than under no liberties, as this group is now relatively richer. If interior, the preferred tax rate by *sl* would be:

$$t_1^{sl} = \frac{E(w^2)(1 + \rho) - w_l^2(2 - x_s)}{2E(w^2)(1 + \rho) - w_l^2(2 - x_s)} < t_0 \quad (9)$$

Note that  $1 + \rho$  reflects the value of consumption complementarities from full liberties for the whole of society, while  $(2 - x_s)$  reflects the value of consumption complementarities from full liberties for the seculars only. If the seculars are in a majority, this will be the tax that will be implemented, given  $\ell = 1$ , as naturally the high-productive secular group will also support it. As economic polarisation is relatively low,  $t_1^{sl}$  will be relatively low as well, but it would increase in  $\sigma$  (the share of the seculars which contribute to a larger aggregate output) and decrease in religious polarisation (as it makes the *sl* relatively richer and hence less favorable to taxation). Moreover, it is easy to see that when economic polarisation is low enough (for example when  $\frac{w_h^2}{w_l^2} \rightarrow 1$ ), and as  $1 + \rho < 2 - x_s$ , the tax rate would be set at 0.

The ideal tax policy for the *rh* group on the other hand will be higher than  $t_0$  as they become relatively poor when religiosity is the main cleavage, and will be set at

$$t_1^{rh} = \frac{E(w^2)(1 + \rho) - w_h^2(1 + (1 - x_r)\alpha)}{2E(w^2)(1 + \rho) - w_h^2(1 + (1 - x_r)\alpha)}. \quad (10)$$



Note that given that religious polarisation is higher than economic polarisation, then  $t_1^{rh} > t_0$ . Observe that the desired tax of the religious when  $\ell = 1$ ,  $t_1^{rh}$ , is increasing in the level of religious polarisation  $\frac{1+(1-x_s)}{1+(1-x_r)\alpha}$  because of the increased income inequality, as well as in the share of seculars,  $\sigma$ , because of the larger aggregate output.<sup>25</sup> This will be the tax that will be implemented if  $\ell = 1$  and the religious are a majority (as the  $rl$  would join  $rh$  to support this). We will have then a relatively high tax set at  $t_1^{rh} > t_0$ , which increases in religious polarisation and in  $\sigma$ .

We now consider voting over  $\ell$ . Voting for  $\ell = 0$  implies that  $t_0$  will be subsequently implemented and voting for  $\ell = 1$  implies that we shall have either  $t_1^{sl}$  or  $t_1^{rh}$  depending on whether the secular or the religious are in a majority. We examine now all the possible majorities.

If seculars are in a majority, they choose full liberties. For any tax level including  $t_0$ , liberties increase aggregate production as well as their own consumption. Moreover, given full liberties,  $t_1^{sl}$  maximizes the utility of the low productive secular group and is closer to the ideal policy of  $sh$  (compared to  $t_0$ ).

If the religious are a majority, what would be the level of liberties? Note that whenever a secular group prefer to repress liberties, so will a religious group with the same productivity level. This is because their utility from repression is the same, while their utility from full liberties is lower. Moreover, as  $t_1^{rh} > t_0$ , then if  $sl$  supports repression so will  $sh$  (as the high productive group is even better off with the reduction of taxation that arises with repression). Thus if repression of liberties arises, all religious groups must support it.<sup>26</sup>

The religious individuals face the following trade-off. Liberties increase aggregate production but make them much poorer compared with the other groups. If the increase in aggregate production (driven by  $\rho$ ) and the higher transfers they receive (given also the higher tax rate) can compensate them for their own reduction in income (because of the disincentive effect of the social facet of liberties  $\alpha$ ), they would also prefer full liberties. However,

<sup>25</sup>To see that  $t_1^{rh}$  increases in religious polarization and in  $\sigma$ , we can re-write (substituting for the expression for  $\rho$ ) :

$$\frac{1 + \rho - (1 + 1 - x_r)\alpha}{2(1 + \rho) - (1 + 1 - x_r)\alpha} = \frac{\sigma\left(\frac{1+(1-x_s)}{1+(1-x_r)\alpha} - 1\right)}{2\sigma\left(\frac{1+(1-x_s)}{1+(1-x_r)\alpha} - 1\right) + 1}$$

<sup>26</sup>To see why, note that any coalition either includes all the religious groups or is not majoritarian. To garner a majority, either  $sl$  and  $rl$  need to support repression, or  $rh$  and  $rl$ . In the first case however so will  $sh$  and hence  $rh$ . Thus the coalition must include all religious groups.

if the positive income transfer does not compensate for the utility cost for the religious from the social effect of liberties, the religious majority will support the elimination of liberties even at the cost of lower redistribution.

To derive the preferences of the religious individuals consider the limit case when  $\frac{w_h^2}{w_l^2} \rightarrow 1$  so that we are arbitrarily close to full equality in productivities, say  $w_h^2 = w_l^2 = E(w^2) = 1$ . Thus, both religious groups will face a similar trade-off. With no liberties all individuals will have the same income and hence there will be no taxation,  $t_0 = 0$ . Using (6), the individual utility is

$$v_r(0) = \frac{1}{2}.$$

With full liberties, even if all have the same productivity, the seculars will work harder and thus obtain an income higher than the religious one. The religious (and also poor) majority will in this case impose  $t_1^{rh} = \frac{(1+\rho)-(1+(1-x_r)\alpha)}{2(1+\rho)-(1+(1-x_r)\alpha)} > 0$  and will obtain a utility of

$$v_r(1) = \frac{1}{2}(1-t_1)^2[1+(1-x_r)\alpha]^2 + t_1(1-t_1)(1+\rho)[1+(1-x_r)\alpha].$$

Therefore, the religious will prefer no liberties and no taxation to liberties and redistribution whenever

$$(1-t_1)^2[1+(1-x_r)\alpha]^2 + 2t_1(1-t_1)(1+\rho)[1+(1-x_r)\alpha] \leq 1.$$

Plugging for  $t_1 = t_1^{rh}$ , this condition becomes

$$1+(1-x_r)\alpha < \frac{2(1+\rho)}{1+(1+\rho)^2},$$

and given the strict inequality such preferences remain for sufficiently small economic polarisation.

**Remark 8** *Let the religious be in a majority. Then for a low enough degree of economic polarisation, liberties are repressed if  $1+(1-x_r)\alpha < \frac{2(1+\rho)}{1+(1+\rho)^2}$ .*

The expression  $\frac{2(1+\rho)}{1+(1+\rho)^2}$  decreases in  $\rho$ . Therefore, the higher is religious polarisation (through  $\alpha$  or  $x_r$ ), and the lower is  $\sigma$ , the more likely it becomes to have repression.<sup>27</sup> For example, when  $\rho = 0$ , repression must arise. Intuitively, society is sufficiently religious

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<sup>27</sup>Higher religious polarization would decrease  $\rho$  and increase  $\frac{2(1+\rho)}{1+(1+\rho)^2}$ , while it would decrease  $1+(1-x_r)\alpha$ . Similarly, a lower share of seculars would decrease  $\frac{2(1+\rho)}{1+(1+\rho)^2}$ .

so that when liberties are allowed the aggregate output does not increase, and thus for the religious there is only loss from liberties (in the form of  $\alpha$ ).

Note that the repression of liberties induces lower taxes as we move from  $t_1^{rh}$  to  $t_0 < t_1^{rh}$ . This is in line with our previous result in which we have seen that the preferences of religious individuals over taxes can be non-monotonic in their religiosity levels. Once too religious, such individuals prefer repression of liberties, which, by the virtue of creating more income equality in society (albeit possibly lower aggregate output), reduces incentives for redistribution. In the political model a similar result arises. When liberties are allowed, religious agents are pivotal over taxation, both because they are a majority but also because they are all poorer than the secular agents when religious polarisation is high relative to economic polarisation. They will therefore vouch for high taxes that increase in religious polarisation. But once religious polarisation increases further, religious individuals (while also becoming very poor) will vote for repression of liberties which will lead to lower taxes as a result of lower income inequality due to the suppression of incentives to the secular. Taxes and redistribution will therefore be non-monotonic in religious polarisation.

### 4.3 The general case

As in the previous subsection, we solve the problem backwards. First we obtain the majoritarian tax rate for either level of individual liberties and, given this outcome, we derive the majoritarian policy towards liberties. The derivations of the results are long and intricate and are thus relegated to the Appendix. In this section we simply summarise them and provide the intuition behind them.

In the general case too we find that what is important is whether religious polarisation is greater or smaller than economic polarisation, and whether the religious or the seculars are in the majority. We continue to assume that the low productivity individuals, secular and religious together, are in a majority.

Specifically, concerning the stage of choosing taxation, given the previously chosen liberties, we obtain the following alternative scenarios.

**Proposition 9** *Under no liberties, taxes are determined by the low productive agents as in (8). Under full liberties, if economic polarisation is high, the low productive agents will continue to be poorer and hence the sl will be the pivotal group and impose their preferred tax rate as defined in (9). When economic polarisation is low, the vote will split along religious lines. If the secular are in a majority the sl will once more be pivotal whereas if the religious*

are in a majority, the pivotal group will be the  $rh$  and the tax would be as defined in (10). It is higher than (8) iff economic polarisation is sufficiently low.

We then turn to the choice of liberties. When the seculars are a majority, there are full liberties as both secular groups prefer liberties but also the lower tax rate which arises in this case, which is ideal tax of the low productive secular group,  $sl$ . The tax can be zero or positive, but must be lower than in (8), as  $sl$  become relatively richer with liberties. Higher religiosity will result in lower taxes because society becomes less productive and the secular groups become less inclined to redistribute.

When the religious are a majority, the result depends on whether religious polarisation is larger or smaller than the economic polarisation. If religious polarisation is large while economic polarisation is relatively low, then the result is as in Remark 8, where repression arises for high enough religiosity and also results in lower taxes. If economic polarisation is higher on the other hand, then under full liberties, the tax level is lower than in (8). The reason is that the  $rh$  group remain sufficiently rich (as the religious cleavage is relatively small). Thus, as when religiosity is sufficiently high the religious majority imposes repression of liberties, it is now accompanied by higher taxes.

To summarize:

**Proposition 10** *Let  $\rho > 0$ . Then: (i) When the seculars are a majority, the political outcome is full liberties and the tax which is the ideal policy of the low productive secular group. (ii) When the religious are a majority, then repression of liberties arises when religiosity is sufficiently high. If religious polarisation is larger than economic polarisation, it results in lower taxes, while if economic polarisation is larger, then it results in higher taxes. (iii) When  $1 + (1 - x_r)\alpha < \frac{2(1+\rho)}{1+(1+\rho)^2}$ , repression is more likely to arise when economic polarisation is very low rather than when it is very high.*

Observe that while repression can arise both when religious polarisation is larger or smaller than economic polarisation, we show that it is more likely to arise in the former case (that is, for a larger set of religiosity parameters). For the case of very low economic polarisation it arises, as in Remark 8, whenever the condition in the Proposition above is satisfied, while for very high economic polarisation it does not always arise even when this condition is satisfied. The reason for this is that, as discussed above, we need the two religious groups to support repression. This is easier to achieve (in the sense that there are less constraints) when the

two religious group have more aligned preferences, which naturally arises in the case of low economic polarisation.

## **5 Discussion of the results**

### **5.1 Religiosity and redistribution**

The discussion above reveals that there are two reasons why more religious societies induce lower taxation in our model. One reason is that societies become less productive. In cases in which the tax is determined by the ideal policy of a secular group, this implies lower taxes as such groups are less inclined to subsidize the religious (as in Case (i) in Proposition 10). This holds for a fixed level of liberties. A second reason is that higher religiosity will result in repression of liberties. This is more likely to arise in the case of low economic polarisation, where the main conflict is along religious rather than class lines. In this case, when liberties are allowed, taxes are determined by the religious and are therefore quite high (as the productive religious agents are relatively poor and therefore demand -and attain- high taxes). But when liberties are repressed taxes are lower as they are determined by economic polarisation and not religious polarisation. In the other case, when economic polarisation or the class conflict takes a centre stage, more religiosity may result in lower liberties but then in higher taxes. While we show that the former case in which repression results in lower taxes is more likely to arise, our analysis above clearly reveals an intricate relationship between religiosity, liberties, and redistribution. It crucially depends on the importance of the religious cleavage relative to economic polarisation. Moreover, it is also likely to be non-monotonic.

### **5.2 The role of religiosity**

We now address the comparative statics analysis of the effect of changes in religiosity. In our case this is particularly pertinent because the level of religiosity or the concern for what others might be doing can be influenced by culture, education, media and so on. One possible question that we can ask then is whether the elite in society (the productive agents, or possibly the secular productive agents) can alter economic outcomes and in particular lower redistribution by affecting religiosity (e.g., by influencing share of the secular population  $\sigma$  or the social dimension of liberties  $\alpha$ ).

Let us start with a very simple observation. Suppose the economy has no liberties either because the religious individuals are in a majority and have intense religiosity or because  $\alpha$  is so high that society is religious in the aggregate —hence,  $\rho < 0$ . In this economy taxation depends on economic polarisation only. Hence, the

only way of affecting taxation further –without changing economic polarisation– is by influencing the religiosity parameters which affect the choice of both liberties and taxation.

One way to do so, is by reducing the importance assigned to having one’s own religious/secular rules be universally binding,  $\alpha$ . Even with the majority of the population being religious, a small enough  $\alpha$  will turn the society secular,  $\rho > 0$ , and might render full liberties politically viable. Therefore, turning religiosity into a personal matter pertaining only to the private sphere –lowering  $\alpha$ – turns even the religious individuals sympathetic towards individual liberties, enhances the incentives to the secular population, increases aggregate productivity, and, as long as economic polarisation is large enough, reduces taxation. A change in  $\alpha$  can as well result from a new religion or a new way of interpreting an existing one.<sup>28</sup>

Another way to do so, is to influence religious individuals to turn secular (i.e., having a lower  $x$ ) which increases the tendency to vote for full liberties. When the seculars are a majority, full liberties arise and moreover, the tax will be lower than the one determined only by the economic polarisation dimension, as in (9) (as the low productive secular agents become relatively rich with liberties). Once with full liberties though, the tax imposed by the  $sl$  would be strictly increasing with  $\sigma$  through the increase in output per capita via the increase in  $\rho$ . Therefore, even though  $t_1^{sl} < t_0$ , the larger the share of the secular population the higher the tax, converging towards  $t_0$  as  $\sigma \rightarrow 1$ . In sum, a too successful effort of turning individuals into secularism may end up bringing redistribution back to where it was. By the very same argument, if we started in a secular society with full liberties, turning secular individuals into religious would bring about a fall in taxation. Once more, this path has non-monotonicity because going too far would create a society without liberties and with a taxation higher than before.

We now pose this question formally. Suppose that the secular are a large majority. Who among them (the low or high productive agents) would benefit from an increase in religiosity (a decrease in  $\sigma$ , an increase in  $x_r$ , or an increase in  $\alpha$ ) while maintaining the seculars as a majority? Note that as the seculars would be maintained as a majority, there would be full liberties and the tax

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<sup>28</sup>On this line, it can be argued that one of the distinguishing features of Protestantism versus Catholicism is the personal, direct relationship of the individual with god, suggesting a radical change in the weight given to one’s own responsibility relative to the social pressure and the control of the others. This suggests the basis for an explanation of the higher economic performance of Protestant countries complementary to the classic Weberian thesis.

rate would still be set by the preferences of the  $sl$  group as in (9).

Two effects arise when religiosity increases. First, the aggregate output decreases, manifested in the decrease of  $\rho$ , which represents a loss for the seculars. On the other hand, this implies that the majoritarian tax rate under full liberties will decrease too which is a gain for the highly-productive secular agents.

The low-productivity secular agents will surely lose then from an increase in religiosity. They will lose from the lower aggregate output, and as the tax level is set at their optimum, by the envelope theorem, a change in tax will not benefit them (as  $\frac{\partial v_{sl}}{\partial t}|_{t_1^{sl}} = 0$ ). For the high-productivity secular agents on the other hand this can result in a gain as the reduction in taxes may be sufficiently high.

**Proposition 11** *When  $\sigma$  is sufficiently high, if religiosity increases (by reducing  $\sigma$ , increasing  $x_r$  or increasing  $\alpha$ ), then the low-productivity secular group always loses while the high-productivity secular group may gain if economic polarisation is not too high.*

This result points at a motive of the high-productivity seculars to split the low-productivity agents and divide them according to religiosity. A secularization trend for example might be met by counter attempts of the high-productive agents to turn the population more religious.

### 5.3 Correlation between religiosity and productivity

We have so far assumed that there is independence between religiosity and productivity. Our analysis revealed though that religious agents—as long as there are some liberties—are poorer than the secular ones for the same level of productivity. If productivity is a result of an investment we should expect, in the long term, that religiosity would be correlated with low productivity levels.

To illustrate, consider now a model with just two groups of agents, low productivity religious agents and high productivity secular agents. How will the results of the political model change?

Economic polarisation is larger for any  $\ell$ , which implies that the tax demanded is

$$t_\ell^{rl} = \frac{(1 - \sigma) + \sigma \frac{w_h^2}{w_l^2} [1 + (1 - x_s)\ell] - [1 + (1 - x_r)\alpha\ell]}{2[(1 - \sigma) + \sigma \frac{w_h^2}{w_l^2} [1 + (1 - x_s)\ell]] - [1 + (1 - x_r)\alpha\ell]}$$

which is higher than the tax demanded by  $rl$  when there are four groups, and thus higher than the tax determined by the political system (which is  $t_\ell^{sl}$  or  $t_\ell^{rh}$ ).

Note that there are therefore two effects when the distribution generally shifts from low productivity secular agents to low productivity religious agents. First, the output decreases as the religious agents have less incentive to work. Second, the political power (the median voter) shifts towards the low productivity religious agents. At the extreme, if indeed all low productivity agents are religious, they have the majority and hence they would determine the tax according to their will. In our model it implies that when society shifts from having a few low productivity secular agents to none, then the incentives of the low productivity religious agents to reduce liberties is actually reduced, as the social output is hardly affected but they now determine the tax rate for any level of liberties. This “decision power” increases their utility. Thus, counterintuitively, there would be less pressure for the reduction of liberties.

## 6 Empirical Analysis (preliminary)

In this section we test the following implications of the model. First, that effort is negatively related to religiosity and this effect is amplified by the degree of liberties. Second, that income is negatively related to religiosity and the effect is amplified by the degree of liberties.

### 6.1 Data and variables

Data on individual attitudes and attributes come from the European Social Surveys (ESS). We considered data from all the rounds (2002, 2004, 2006, 2008, 2010, 2012) and all countries available (at most 34). We use these data to compute the following variables.

**Religiosity.** The ESS contain three variables reflecting individual’s religiosity. *Pray* is the respondent’s monthly frequency of praying apart from religious services, expressed as the number of days of praying in one month. This variable can take 6 different values. *Religiosity* is self-reported religiosity on a scale from 0 to 10. *Religious attendance* is the respondent’s monthly frequency of attendance to religious services (7 values).

We use principal components to obtain an index of religiosity, *Relig*, for each of the individuals in our sample.

**Dependent variables.** We consider two dependent variables. Total workhours is the number of hours per week (in main job), excluding any paid or unpaid overtime. The variable *hhincome* is household income. For survey 2008, 2010 and 2012 there are 10 deciles, for survey years 2002, 2004 and 2006 there were 12 income brackets. For each decile or bracket, the middle point was taken.



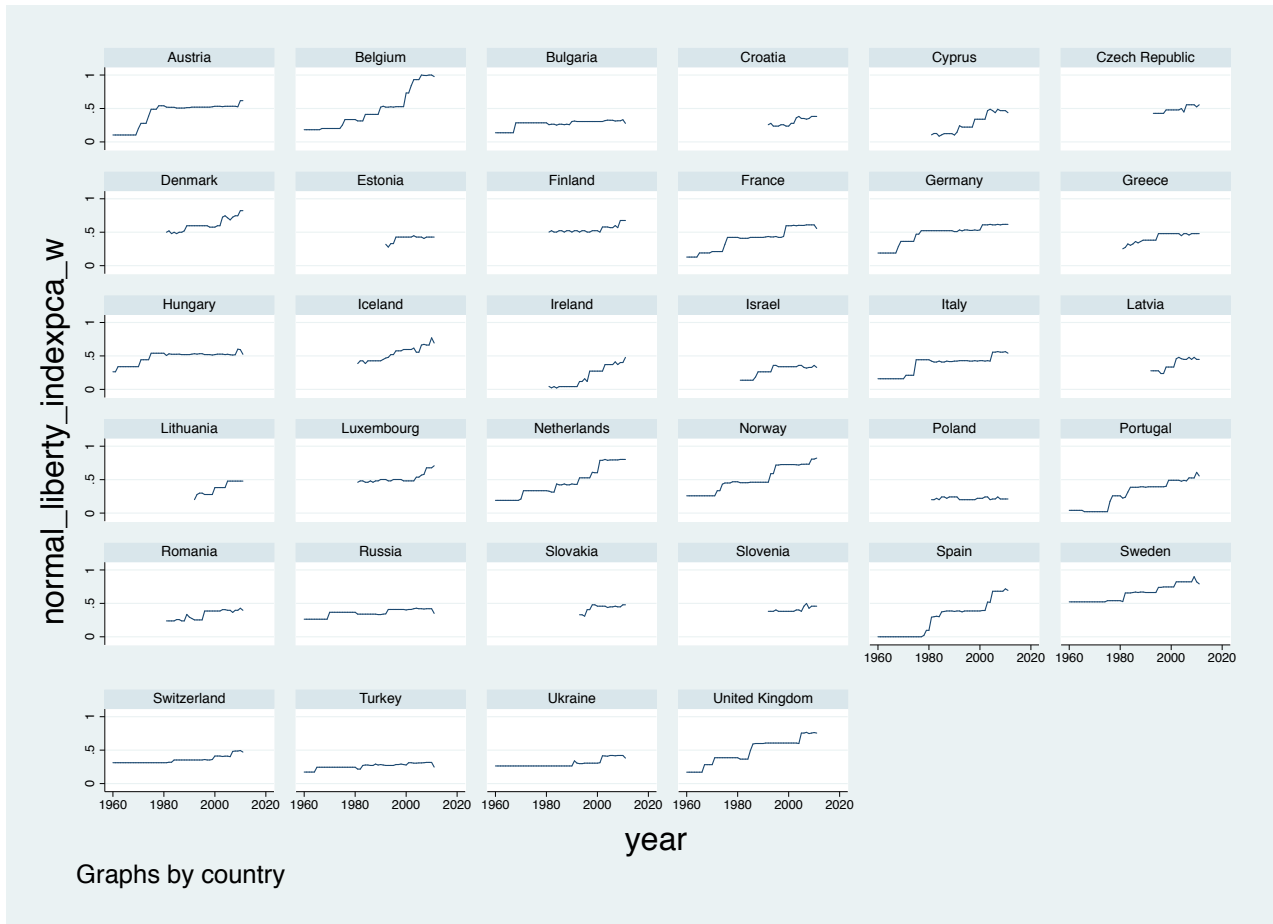


Figure 1: Legal evolution of civil liberties, 1960-2013

**Controls.** We use the following controls: Age and age squared, gender, marital status, years of completed education, and whether there are children in the household, religion dummies per denomination and country indicators and dummy variables indicating the year of the survey are employed in all regressions.

**Liberties.** We create an index of the legal evolution of civil liberties from 1960 to 2013 for each of the countries in our dataset reflecting the legislation on abortion, divorce, women's rights, LBBT rights, and Euthanasia. The sources are the UN, EU parliament, World Bank, Human Rights Project, Pew Research Center, International Freedom to Marry.

We construct an index of liberties using the weights of the first principal component of the above mentioned variables. Figure 1 displays the evolution of the index in Europe from 1960 to the present. Although we restrict our attention to European countries, there is substantial variability in the degree of variables afforded

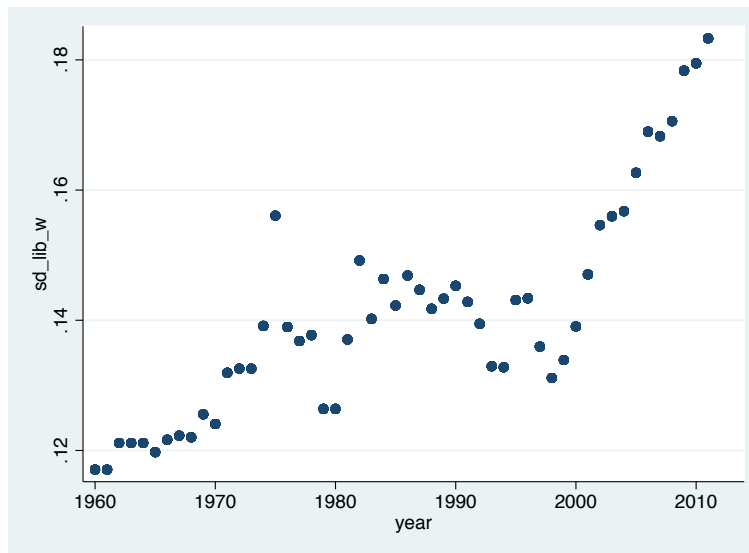


Figure 2: Variability of civil liberties across countries, 1960-2013

both over time and across countries. Figure 2 depicts the standard deviation of the Liberties index for each of the years of the period considered. Figures 1 and 2 reveal that the degree of liberties afforded was relatively low and homogeneous across the European states during the 60's and the 70's. During the 80's and 90's the variability of the index increased considerably with respect to the previous period, reflecting the legal changes occurring in some, but not all, of the countries in the dataset. This pattern becomes more noticeable from 2000 onwards when the variability of the index reaches its maximum.

In the empirical analysis we consider a time-invariant measure of civil liberties computed as the average over time of the above-described index of liberties for each country. By using a measure that contains both past and current values, we aim to capture two facts: Firstly, changes in the law might take some time until they are socially accepted and they become widely used. Secondly and more importantly, past liberties might also have an important impact in current outcomes. For instance, if someone decided not to undertake higher education because of a low degree of liberties, the inertia of this decision in her subsequent earning potential will be very high even if the legal framework changes completely.

## 6.2 Results

We start by testing the implication of our model that effort is negatively related to religiosity and this effect is amplified by the degree of liberties. We regress hours worked against religiosity

Variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]
pray	-0.058*** (0.008)	-0.023 (0.020)	-0.025 (0.021)	-0.023 (0.021)	-0.007 (0.020)	0.048* (0.025)	0.048* (0.025)
pray × Lib		-0.119* (0.061)	-0.113* (0.060)	-0.119* (0.062)	-0.146** (0.070)	-0.181** (0.079)	-0.182** (0.079)
age			0.208*** (0.054)	0.199*** (0.054)	0.316*** (0.050)	0.295*** (0.053)	0.328*** (0.056)
agesq			-0.002*** (0.001)	-0.002*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.004*** (0.001)
eduyrs				0.064 (0.053)	0.087* (0.048)	0.110** (0.045)	0.108** (0.045)
maritalstatus					0.407*** (0.146)	0.192 (0.132)	0.031 (0.119)
gender						-6.262*** (0.549)	-6.188*** (0.529)
children							-0.672** (0.264)
C	43.428*** (0.224)	43.405*** (0.223)	39.075*** (1.091)	38.351*** (1.197)	35.299*** (1.422)	39.429*** (1.292)	39.380*** (1.341)
R <sup>2</sup>	0.046	0.046	0.047	0.048	0.047	0.103	0.104
Obs.	159345	159345	158832	158832	79361	79334	79177

Table 1: Hours worked, religiosity and liberties

as captured by frequency of pray. The theory predicts that this relation has to be negative. According to the theory the effect of religiosity is enhanced by the degree of individual liberties. To this effect we add hours of pray interacted with level of individual liberties. The model predicts a negative relationship. We add as controls age, age squared, years of education, marital status, gender, children, together with the sets of dummies.

The first column simply includes religiosity. It turns out to be highly significant and with the negative sign as predicted. The second column adds religiosity interacted with liberties. This term turns out to be significant and religiosity alone ceases to be so. As we add the different controls we can observe that the significance and the size of the coefficient of the interacted term continues unaltered. The sign and significance of the controls is as to be expected. Gender is highly significant and very large.

Our results are in line with the previous works on the effect of religiosity on labour supply. Yet our work differs in a number of important ways. We introduce the novel argument that individual liberties amplify the effect of religiosity. Indeed we obtain that this interacted term is significant even when we include mere religiosity. Also, previous work has focused on the changes in female labor supply. Here we include all the respondents of the survey and the result continues to be strong and negative. One could suspect that this correlation was essentially driven by the female respondents. But notice that when we introduce gender as a control [large and highly significant] we continue to find that religiosity and religiosity interacted with liberties continue to obtain similar values and levels of significance.

Variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]
pray	-96.7*** (12.0)	-26.9 (33.4)	-5.5 (35.1)	30.7 (32.7)	69.2* (38.8)	91.0** (40.3)	87.4** (40.3)
pray × Lib		-227.3** (109.0)	-252.1** (112.4)	-354.9*** (107.8)	-515.6*** (139.0)	-526.8*** (141.5)	-516.9*** (141.7)
age			770.1*** (114.2)	634.3*** (102.4)	148.7** (69.6)	128.7* (69.5)	50.4 (67.3)
agesq			-8.9*** (1.2)	-6.9*** (1.1)	-2.7*** (0.8)	-2.5*** (0.8)	-1.5* (0.8)
eduysr				854.1*** (71.1)	809.4*** (92.7)	814.5*** (92.9)	824.1*** (92.5)
maritalstatus					-2983.8*** (401.1)	-3081.4*** (405.0)	-2694.2*** (405.4)
gender						-2671.7*** (366.5)	-2880.4*** (359.2)
children							1731.4*** (563.027)
C	3836** (1827)	3762** (1843)	-11435*** (3528)	-20387*** (3548)	2223 (1565)	7580** (3145)	7349** (3152)
$R^2$	0.419	0.419	0.425	0.441	0.448	0.451	0.451
N	130623	130623	130312	130312	65511	65503	65387

Table 2: Income, religiosity and liberties

The second implication of our model is that income is negatively related to religiosity and this effect is amplified by the degree of liberties.

We regress income [central value of the decile] against religiosity as captured by frequency of pray. The theory predicts that this relation has to be negative. Here too the theory says the effect of religiosity is enhanced by the degree of individual liberties. To this effect we add hours of pray interacted with level of individual liberties. The model predicts a negative relationship. We also add as controls age, age squared, years of education, marital status, gender, children, together with the sets of dummies.

The first column simply includes religiosity. It turns out to be highly significant and with the negative sign as predicted. The second column adds religiosity interacted with liberties. This term turns out to be significant and religiosity alone ceases to be so. Furthermore, the size of the coefficient is much larger. As we add the different controls the significance and size of the coefficient of the interacted term remains unaltered. With all the controls, pure religiosity has a significant and positive coefficient. The sign and significance of the controls is as to be expected. Gender is once more highly significant and very large.

Finally, note that the  $R^2$  for religiosity and religiosity interacted is substantially larger than in the previous table and merely increases by 10 percent when we add all the controls. This suggests two implications. First, religiosity, together with the interacted term, seems to explain a good part of the variability in incomes. The obvious variables like age, education, are significant but add little to the  $R^2$ . Also, comparing with the first result, it seems that

religiosity not only has a negative influence on hours worked, but also on the hourly wage rate as obtained by Dilmaghani (2012). This lack of effort in finding the best paid job is consistent with the finding by Clark and Leikes (2005) that religious unemployed are less active in looking for a job.

After introducing all the controls, pure religiosity still has a significant and positive coefficient, independent of the interacted term. This may capture the arguments in favour of a positive effect of religious practice via trust and network connections, as in Guiso, Sapienza and Zingales (2003).

Finally, note that we have so far established correlation and causality is still an issue, which remains for future research.

## 7 Conclusion

In this paper we have incorporated the effect of religiosity on preferences for liberties. We have shown -theoretically and empirically- that wider liberties imply that religious individuals work less and earn less than secular individuals. We have characterized the preferences of seculars and religious individuals over the two-dimensional policy space of liberties and redistribution. In a simple political model we have shown that the relation between religiosity, redistribution and liberties is intricate and depends on whether religious polarisation is larger or smaller than economic polarisation in society (with both contributing to income inequality but across different parts of society). We have shown that political outcomes of redistribution can be non-monotonic in religiosity with for example taxes first increasing and then decreasing along with repression of liberties. In our future research we aim to test these more nuanced empirical predictions.

## Appendix I: Analysis of the four groups model

We now provide a precise statement of the results presented in subsection 4.3 and the corresponding proofs. It will be useful to define  $\lambda_i \equiv \frac{E(w^2)}{w_i^2}$ . Note that  $\lambda_h \leq 1$  and that  $\lambda_l \geq 1$  and that  $\frac{\lambda_l}{\lambda_h} = \frac{w_h^2}{w_l^2}$ . We analyze here the case of  $\rho > 0$ .

### A. Voting over taxes

We consider now the second stage in which society votes over taxes.

**Proposition 9** *Let the low productivity types be in a majority. Then,*

1. When  $\ell = 0$ , then the majoritarian tax

$$t_0 = t_{sl}(0) = \frac{\lambda_l - 1}{2\lambda_l - 1}$$

is positive and is the optimal tax for the low-productivity groups.

2. When  $\ell = 1$ , then:

(a) if  $\frac{w_h^2}{w_l^2} > \frac{1+(1-x_s)}{1+(1-x_r)\alpha}$ , the low incomes will form a majority with

$$t_1 = t_{sl}(1) = \max \left( 0, \frac{\lambda_l - \frac{1+(1-x_s)}{1+(1-x_r)\alpha}}{\sigma \frac{1+(1-x_s)}{1+(1-x_r)\alpha} + (1-\sigma)} \right) < t_0;$$

(b) if  $\frac{w_h^2}{w_l^2} < \frac{1+(1-x_s)}{1+(1-x_r)\alpha}$  the majority will form along religious lines and then,

• if  $\sigma \geq \frac{1}{2}$  the secular majority will impose

$$t_1 = t_{sl}(1) = \max \left( 0, \frac{\lambda_l - \frac{1+(1-x_s)}{1+(1-x_r)\alpha}}{\sigma \frac{1+(1-x_s)}{1+(1-x_r)\alpha} + (1-\sigma)} \right) < t_0, \text{ and}$$

• if  $\sigma < \frac{1}{2}$  the religious majority will impose

$$t_1 = t_{rh}(1) = \max \left( 0, \frac{\lambda_h - \frac{1}{\sigma \frac{1+(1-x_s)}{1+(1-x_r)\alpha} + (1-\sigma)}}{2\lambda_h - \frac{1}{\sigma \frac{1+(1-x_s)}{1+(1-x_r)\alpha} + (1-\sigma)}} \right) > t_{sl}(1),^{29}$$

with  $t_1 > t_0$  iff  $\frac{w_h^2}{w_l^2} < \frac{1+\rho}{1+(1-x_r)\alpha}$ .

The proof is straightforward as explained in the text. Whenever the seculars are a majority, the tax preferred by  $sl$  must win as it either garners the support of  $rl$  or the support of  $sh$  which is sufficient for a majority. When the religious are a majority, then the tax which is the maximum among  $t_{rh}(1)$  or  $t_{sl}(1)$  will win as it will gain the support of the  $rl$ .

<sup>29</sup>The fact that  $t_{rh}(1) > t_{sl}(1)$  follows as  $\frac{w_h^2}{w_l^2} < \frac{2-x_s}{1+(1-x_r)\alpha}$ .

## B. Voting over liberties

We now analyze the first stage in which voters choose the level of the cap on liberties. The consequence of choosing  $\ell = 0$  is  $t_0 = t_{sl}(0)$  as defined in Proposition 9 and the consequence of  $\ell = 1$  is the tax  $t_1$  which can be either  $t_{sl}(1) < t_0$  or  $t_{rh}(1)$  as defined in Proposition 9, depending on who is pivotal in the second stage of the political game. Note that all secular individuals prefer  $(\ell = 1, t)$  to  $(\ell = 0, t)$  for any fixed  $t$ , as liberties increase both their own income and the aggregate output.

We now consider the voting behaviour of each group.

**Proposition 12** *Let society be secular, with  $\rho \geq 0$ . Then the vote on liberties by each group is:*

1. Secular Low: *sl* always vote for  $\ell = 1$ .
2. Secular High: *sh* always vote for  $\ell = 1$  when  $t_1 \leq t_0$ .<sup>30</sup>
3. Religious Low: *rl* vote as follows:
  - (a) *rl* vote for  $\ell = 0$  if
    - i.  $t_1 = 0$ .<sup>31</sup>
    - ii.  $t_1 \leq t_0$  and  $[1 + (1 - x_r)\alpha] \leq \frac{1}{1+\rho}$ .
    - iii.  $t_1 > t_0 \approx 0$  and  $[1 + (1 - x_r)\alpha] < \frac{2(1+\rho)}{1+(1+\rho)^2}$ .<sup>32</sup>
  - (b) *rl* vote for  $\ell = 1$  if  $t_1 > t_0$  and  $\alpha$  is sufficiently small.<sup>33</sup>
4. Religious High: *rh* vote as follows:
  - (a) *rh* vote for  $\ell = 0$  if
    - i.  $t_1 = 0$  and  $[1 + (1 - x_r)\alpha] < \frac{\sqrt{\lambda_l(\lambda_l + 2\lambda_h(\lambda_l - 1))}}{2\lambda_l - 1} < 1$ .
    - ii.  $t_1 \leq t_0$  and  $[1 + (1 - x_r)\alpha] < \min \left\{ \frac{\lambda_l}{2\lambda_l - 1}, \frac{1}{1+\rho} \right\} < 1$ .
    - iii.  $t_1 > t_0 \approx 0$  and  $[1 + (1 - x_r)\alpha] < \frac{1+\rho}{1+\rho+\rho^2/2} < 1$ .
  - (b) *rh* vote for  $\ell = 1$  if  $\alpha$  is sufficiently small and (i)  $t_1 \leq t_0$  and  $\frac{w_h^2}{w_l^2} > \frac{1+\rho}{1+(1-x_r)\alpha}$  or  $\sigma < 0.5$ . (ii)  $t_1 \geq t_0$ .

<sup>30</sup> $t_1 \leq t_0$  arises when  $\sigma \geq 1/2$  or if  $\sigma < 1/2$  and  $\frac{w_h^2}{w_l^2} > \frac{1+\rho}{1+(1-x_r)\alpha}$ .

<sup>31</sup>This arises when  $\lambda_l < \frac{2-x_s}{1+\rho}$  and either  $\sigma \geq 1/2$  or  $\lambda_h > \frac{1+\rho}{1+(1-x_r)\alpha}$  and  $\sigma < 1/2$ .

<sup>32</sup> $t_1 > t_0 \approx 0$  arises when  $\sigma < 1/2$  and  $\frac{w_h^2}{w_l^2} \approx 1$ .

<sup>33</sup> $t_1 > t_0$  arises when  $\frac{w_h^2}{w_l^2} < \frac{1+\rho}{1+(1-x_r)\alpha}$  and  $\sigma < 1/2$ .

**Proof. 1.** For the  $sl$  group, we now show that they must vote for full liberties. Preference for  $\ell = 1$  in all cases but the one with  $\frac{w_h^2}{w_l^2} < \frac{1+\rho}{1+(1-x_r)\alpha}$  —that is with  $t_{rh}(1) > t_{sl}(0)$  and  $\sigma < 0.5$ — follow from  $v_{sl}(0, t_0) < v_{sl}(1, t_0) < v_{sl}(1, t_{sl}1)$  where the first inequality follows from  $\rho > 0$  and the second follows from concave utility in  $t$ , and  $t_1 \in (t_{sl}(1), t_0)$ .

For the remaining case, note that the utility from  $\ell = 1$  minus the utility from  $\ell = 0$  for the  $sl$ ,  $\Delta_{sl}$ , is

$$\Delta_{sl} = (1-t_1)^2(2-x_s)^2 - (1-t_0)^2 + 2\lambda_l \left[ (2-x_s)(1-t_1)t_1(1+\rho) - (1-t_0)t_0 \right]. \quad (11)$$

We know this is positive at  $\alpha = 0$  and at minimum inequality as it simplifies to:

$$\begin{aligned} \Delta_{sl} &= \left( \frac{1}{2 - \frac{1}{2-x_s}} \right)^2 (2-x_s)^2 - 1 + 2 \left( \frac{1 - \frac{1}{2-x_s}}{2 - \frac{1}{2-x_s}} \right)^2 (2-x_s)^2 = \\ &= \left[ \frac{4 - 2x_s + x_s^2}{4 - 2x_s - 1} \right]^2 \left[ 1 + 2 \left( 1 - \frac{1}{2-x_s} \right)^2 \right] - 1 > 0. \end{aligned}$$

Now let us increase inequality  $\left(\frac{w_h^2}{w_l^2}\right)$ . Taking the derivative of  $\Delta_{sl}$  with respect to  $\frac{w_h^2}{w_l^2}$  in (11) and rearranging we have

$$\begin{aligned} d\Delta_{sl} &= 2(2-x_s) \left[ \lambda_l(1-2t_1)(1+\rho) - (1-t_1)(2-x_s) \right] dt_1 + \\ &+ 2 \left[ (1-t_0) - \lambda_l(1-2t_0) \right] dt_0 + 2 \left[ (2-x_s)(1-t_1)t_1(1+\rho) - (1-t_0)t_0 \right] d\lambda_l. \end{aligned}$$

Now look at the elements multiplying  $dt_0$  and  $dt_1$  respectively. Note that  $(1-t_0) - \lambda_l(1-2t_0) = (1 - \frac{\lambda_l-1}{2\lambda_l-1}) - \lambda_l(1 - 2\frac{\lambda_l-1}{2\lambda_l-1}) = 0$ , and  $\lambda_l(1-2t_1)(1+\rho) - (1-t_1)(2-x_s) < 0$  as  $\frac{(1-t_1)}{(1-2t_1)} = \frac{\lambda_h[1+\rho]}{[1+(1-x_r)\alpha]}$  by the first order condition and we know that  $\lambda_l < \frac{\lambda_h[1+\rho]}{[1+(1-x_r)\alpha]}$  in this region. Also note that  $(2-x_s)(1-t_1)t_1(1+\rho) - (1-t_0)t_0 > 0$ . Therefore, taking into account that  $t_1$  decreases,  $t_0$  increases, and  $\lambda_l$  increases with an increase in  $\frac{w_h^2}{w_l^2}$ , the whole derivative is positive. Thus increasing inequality will increase the positive preference for  $\ell = 1$  by the  $sl$ .

Similarly, when we increase  $\alpha$ ,  $\Delta_{sl}$  decreases as  $t_1$  increases (which then decreases the utility of  $sl$  under  $\ell = 1$ ) and  $\rho$  goes down.

So to have the minimum value for  $\Delta_{sl}$  we need to check for the lowest  $\rho > 0$  —which yields the highest  $t_1$ —, and for the lowest



inequality,  $\lambda_h = \lambda_l = 1$  —hence  $t_0 = 0$ . Simplifying (11) with these assumed parameter values, we get that

$$\Delta_{sl} = 1 + 2\frac{1 - x_s}{2 - x_s} - 1 > 0.$$

**2.** For the *sh* group, note that as their preferences for taxation is even lower than that of *sl*, they will never vote for  $\ell = 0$  unless  $t_1 > t_0$ . In this case note that near full equality their preferences would be similar to *sl* and thus as above they will not support  $\ell = 0$ , whereas when  $t_1$  is close to  $t_0$ , then by  $\rho > 0$  they prefer  $\ell = 1$ . **3.** We now consider the *rl* group. a(i). It is obvious that whenever  $t_1 = 0$ , they vote for  $\ell = 0$ . a(ii). When  $t_1 \leq t_0$ , then  $v_{rl}(1, t_1) < v_{rl}(1, t_0)$  as they prefer higher taxes than  $t_0$ . But when  $\alpha$  is high enough as described in the Proposition, then  $v_{rl}(1, t_0) < v_{rl}(0, t_0)$ . To see this note that a religious person votes for  $\ell = 0$  whenever

$$(1 - t_1)^2(1 + (1 - x_r)\alpha)^2 - (1 - t_0)^2 + 2\lambda_w((1 + (1 - x_r)\alpha)(1 - t_1)t_1(1 + \rho) - (1 - t_0)t_0) < 0 \quad (12)$$

and thus if  $t_1 = t_0 = t$ ,  $(1 + (1 - x_r)\alpha)(1 + \rho) < 1$  is sufficient to induce a religious individual to vote for  $\ell = 0$ . a(iii). In this part  $t_1 > t_0$ . In the case of full equality when  $\lambda_l = \lambda_h = 1$ , we have that

$$t_1 = \frac{1 + \rho - (1 + (1 - x_r)\alpha)}{2(1 + \rho) - (1 + (1 - x_r)\alpha)} \text{ and } t_0 = 0,$$

which implies the result when plugged in (12). b. Note that as  $t_1 > t_0$  and  $\alpha$  is sufficiently small, then  $v_{rl}(0, t_0) < v_{rl}(1, t_0) < v_{rl}(1, t_1)$ . The first inequality follows from a small  $\alpha$ , and the second from  $t_1 > t_0$  which is closer to the optimal tax for *rl*. **4.** Finally consider the *rh* group. a(i). When  $t_1 = 0$ , we get the condition in the Proposition when we plug this and  $t_0 = \frac{\lambda_l - 1}{2\lambda_l - 1}$  in (12), letting  $\lambda_w = \lambda_h$ . a(ii) Note that from (12), then a sufficient condition for this to hold is  $(1 + (1 - x_r)\alpha)(1 + \rho) < 1$  and

$$(1 + (1 - x_r)\alpha)^2 < (1 - t_0)^2 = \frac{\lambda_l^2}{(2\lambda_l - 1)^2}$$

which gives us the result. a(iii) is like case a(iii) in part 3 as we are near equality. Case b is as in part 3 as we also have that  $v_{rh}(0, t_0) < v_{rh}(1, t_0) < v_{rh}(1, t_1)$ . The first inequality follows from a small  $\alpha$ . The second inequality follows from either: (i) *rh* being pivotal in the tax voting stage and hence  $t_1$  is this group's optimal tax for  $\ell = 1$ ; (ii)  $\sigma < 0.5$  and the *rl* group is pivotal which implies that  $t_1$  is higher than the preferred tax of *rh* and hence as in this case  $t_1 < t_0$ ,  $t_1$  is preferred to  $t_0$ . ■

### C. Majoritarian policies

We now study the final step: in view of the optimal voting by every group characterised in the previous subsection we want to obtain the policies that will be chosen by sequential majority voting.

We start with an instrumental Lemma.

**Lemma 13** (i) *If a secular group with productivity  $i = l, h$ , supports  $\ell = 0$ , then the religious group with the same productivity supports  $\ell = 0$  too. (ii) If we have a majority vote for  $\ell = 0$ , all the religious groups must be in this coalition. (iii) If  $t_1 > t_0$ , then if  $\frac{w_h^2}{w_l^2}$  is sufficiently small, if  $rl$  prefers  $\ell = 0$ , so does  $rh$ . If  $t_1 < t_0$  and  $[1 + (1 - x_r)\alpha] < \frac{1}{1+\rho}$ , then if  $rh$  prefers  $\ell = 0$ , so does  $rl$ .*

**Proof.** (i) follows from the observation that for every  $t$ , the utility under  $\ell = 1$  is higher for the secular than for the religious agent with the same productivity, while under  $\ell = 0$  both have the same utility. If  $\ell = 0$  is the preferred option for the secular so must be for the religious. (ii) Recall that  $sl$  does not support repression. Given part (i) in the Lemma, a support of  $sh$  for a restriction of liberties must imply that  $rh$  supports it as well. But for a majority to arise,  $rl$  need to support it too, as the high productive agents are in a minority. This therefore implies that both religious groups support it. (iii) A religious person will support  $\ell = 0$  if and only if:

$$(1 - t_1)^2[1 + (1 - x_r)\alpha]^2 - (1 - t_0)^2 + 2\lambda_i \left[ [1 + (1 - x_r)\alpha](1 - t_1)t_1(1 + \rho) - (1 - t_0)t_0 \right] < 0$$

If  $t_1 > t_0$ , then in the case of full equality, we have  $t_0 = 0$  which implies that what multiplies  $\lambda_i$  is positive and thus if the whole expression is negative for  $rl$ , surely it is negative for  $rh$  (as  $\lambda_h < \lambda_l$ ). If on the other hand  $t_1 \leq t_0$  and  $[1 + (1 - x_r)\alpha](1 + \rho) < 1$ , then what multiplies  $\lambda_i$  is negative, which implies that if  $rh$  prefers  $\ell = 0$  so does  $rl$ . ■

We then have:

**Proposition 14** *Let  $\rho > 0$ . Then the majoritarian policies over liberties in the two step voting procedure are:*

1. *When  $\sigma > \frac{1}{2}$ , we have  $\ell = 1$  and  $t_1$  decreases in religious polarisation  $\frac{1+(1-x_s)}{1+(1-x_r)\alpha}$ .*
2. *When  $\sigma < \frac{1}{2}$  and  $\alpha$  sufficiently small, then  $\ell = 1$ . The tax level  $t_1$  decreases in religious polarisation  $\frac{1+(1-x_s)}{1+(1-x_r)\alpha}$  when it is larger than the level of economic polarisation, and increases in religious polarisation otherwise.*

3. When  $\sigma < \frac{1}{2}$  and  $\alpha$  is large enough, then:<sup>34</sup>

- (a) Let  $t_1 = 0$ , the religious coalition imposes  $\ell = 0$  iff  $[1 + (1 - x_r)\alpha] < \frac{\lambda_l}{2\lambda_l - 1} \sqrt{1 + 2\frac{\lambda_h}{\lambda_l}(\lambda_l - 1)} < 1$ , otherwise the secular groups together with  $rh$  impose  $\ell = 1$ .
- (b) If  $0 < t_1 < t_0$ , the religious coalition imposes  $\ell = 0$  if  $[1 + (1 - x_r)\alpha] < \min\{\frac{\lambda_l}{2\lambda_l - 1}, \frac{1}{1+\rho}\} < 1$ .
- (c) If  $t_1 > t_0$  and  $\frac{w_h^2}{w_l^2}$  sufficiently low, the religious coalition imposes  $\ell = 0$  iff  $[1 + (1 - x_r)\alpha] < \frac{2(1+\rho)}{1+(1+\rho)^2} < 1$ .

**Proof.** (1) The secular coalition is in a majority and will impose  $\ell = 1$  and hence the tax rate preferred by the pivotal group  $sl$ .

(2) If there is a majority for  $\ell = 0$ , by Lemma 13, both religious groups have to support it. We know however by Proposition 12 that when  $\alpha$  is sufficiently low and  $\sigma < 0.5$ ,  $rh$  votes for  $\ell = 1$ .

(3) Follows from the Proposition 12 and Lemma 13. ■

**Proposition 15** Let  $[1 + (1 - x_r)\alpha] < \frac{2(1+\rho)}{1+(1+\rho)^2}$ .<sup>35</sup> Then repression of liberties is more likely to arise when there is sufficiently low rather than sufficiently high economic polarisation.

**Proof.** From the previous Proposition we know that when there is sufficient inequality, then when  $\sigma < 0.5$  (which is the only environment in which restriction can arise), then both  $rl$  and  $rh$  vote for it. It is left to show that when there is sufficient inequality, there are parameters for which this is not the case.

Suppose now that  $w_l \rightarrow 0$ , and that  $(1 + \rho)((1 + (1 - x_r)\alpha)) = 1 + \varepsilon$  for an  $\varepsilon$  which maintains that  $\frac{(1+\rho)^2((1+(1-x_r)\alpha))}{2(1+\rho)-(1+(1-x_r)\alpha)} < 1$  (it is not a problem to find such an  $\varepsilon$ ). Now note that:

$$\lim_{\lambda_l \rightarrow \infty} \frac{(1 - t_1)^2(1 + (1 - x_r)\alpha)^2 + 2\lambda_l((1 + (1 - x_r)\alpha)(1 + \rho)(1 - t_1)t_1)}{(1 - t_0)^2 + 2\lambda_l t_0(1 - t_0)} > 1.$$

To see why, note that  $\lambda_l \rightarrow \infty$ , and hence  $t_0, t_1 \rightarrow \frac{1}{2}$  at the same speed. Thus if we divide all the elements of the expression above by  $\lambda_l$ , we are left with  $(1 + (1 - x_r)\alpha)(1 + \rho)\frac{(1-t_1)t_1}{t_0(1-t_0)}$ . Far enough in the sequence of  $w_l \rightarrow 0$ , we would have that  $\frac{(1-t_1)t_1}{t_0(1-t_0)} > \frac{1}{1+\varepsilon}$  for any fixed  $\varepsilon$ . Thus the  $rl$  group will vote for  $\ell = 1$ . ■

<sup>34</sup>We are expressing the restrictions on the parameters in terms of restrictions on the tax rate for the sake of expositional compactness. The translation from one to the other is in Proposition 9.

<sup>35</sup>Note that when  $\alpha$  is the highest allowed (so that  $\rho = 0$ ), this condition always holds.

## Appendix II: Other missing proofs

**Proof. of Proposition 6** We decompose the statement in the Proposition into the following statements and then prove them: (i) All secular agents prefer  $\ell = 1$ , where all  $(w, x)$  such that  $x < 1$  and  $w > \sqrt{E(w^2)^{\frac{1+\rho}{2-x}}}$  prefer  $t = 0$  and the rest prefer  $t > 0$ . (ii) Religious agents with  $w > \sqrt{E(w^2)^{\frac{1+\rho}{1+(1-x)\alpha}}}$  prefer  $\ell = 0$  and  $t = 0$ . For these define  $x(w) = 1$ . Those with  $w \in [\sqrt{E(w^2)}, \sqrt{E(w^2)^{\frac{1+\rho}{1+(1-x)\alpha}}}]$  and  $x > \hat{x}(w)$  for some  $\hat{x}(w)$  with  $\frac{\partial \hat{x}}{\partial w} < 0$  prefer  $\ell = 0$  and  $t = 0$  and otherwise they prefer  $\ell = 1$  and  $t > 0$ . For these define  $x(w) = \hat{x}(w)$ . (iii) Religious agents with  $w < \sqrt{E(w^2)}$  and  $x > \hat{x}(w)$  prefer  $\ell = 0$  and  $t > 0$  and otherwise they prefer  $\ell = 1$  and  $t > 0$ . For these define  $x(w) = \hat{x}(w)$ .

Now note that: (i) For all secular individuals,  $\ell = 1$  is optimal as  $\rho > 0$ . Thus taxation is then determined as in Proposition 4 which is as described in part (i) of the Proposition.

(ii) For religious individuals with  $w^2 > E(w^2)^{\frac{1+\rho}{1+(1-x)\alpha}}$ , we must have  $t = 0$  as they would prefer 0 taxation for all levels of liberties. As  $t = 0$ , then  $\ell = 0$  is optimal as well as it has no effect on proceeds from social output. Thus for these individuals  $x(w) = 1$ .

For all  $E(w^2) < w < E(w^2)^{\frac{1+\rho}{1+(1-x)\alpha}}$ , for  $\ell = 0$  the optimal  $t$  is  $t = 0$ . These individuals then compare between  $\ell = 1, t(1) > 0$  and  $\ell = 0, t = 0$ . We now define  $x(w) = \hat{x}(w)$  which is the indifferent religiosity level between these two for each  $w$  and show that it decreases in  $w$ . Note that  $\hat{x}(w)$  solves  $F(w, \hat{x}(w)) = 0$ , where  $F(w, x) = v_{w,x}(\ell = 1, t(1)) - v_{w,x}(\ell = 1, 0)$ :

$$F(w, x) = \frac{1}{2}(1 - t(1))^2 w^2 [1 + (1 - x)\alpha]^2 + t(1)(1 - t(1))E(w^2)[1 + \rho][1 + (1 - x)\alpha] - \frac{1}{2}w^2$$

where the first expression is the indirect utility from  $\ell = 1, t(1)$  (where  $t(1)$  is the optimal tax for this individual given full liberties) and the second one is the indirect utility from  $\ell = 0, t = 0$ . We will use the implicit function Theorem to identify  $\hat{x}(w)$  and its properties.

It is straightforward to show that the higher is the level of religiosity (that is, when  $x > \hat{x}(w)$ ), the more attractive is  $\ell = 0, t = 0$ . To see why, note that  $\partial F / \partial t(1) = 0$  by the envelope theorem, and that  $\partial F / \partial x < 0$ . Thus there exists a unique  $\hat{x}(w)$  satisfying indifference.

We now show that  $\frac{d\hat{x}(w)}{dw} < 0$ . Using total differentiation, and using the envelope theorem which implies that the partial derivative

with respect to the taxes is 0, we have that:

$$\frac{d\hat{x}(w)}{dw} = -\frac{\frac{\partial F}{\partial w}}{\frac{\partial F}{\partial x}}$$

Note that  $dF/dx < 0$ , and  $\partial F/\partial w = \frac{1}{2}(1-t(1))^2[1+(1-x)\alpha]^2 - \frac{1}{2} < 0$ . Thus,  $\frac{d\hat{x}(w)}{dw} < 0$ .

(iii) Finally, for all  $w^2 < E(w^2)$ , for all levels of liberties we must have  $t > 0$ . These individuals then compare between  $\ell = 1, t(1)$  and  $\ell = 0, t(0)$  for the optimal  $t$  as determined in (4). We now define  $x(w) = \hat{x}(w)$  for these individuals and show that it decreases in  $w$ . The only difference from the above is that now  $F(w, x) = v_{w,x}(\ell = 1, t(1)) - v_{w,x}(\ell = 1, t(0))$  where  $t(0)$  is the optimal tax for this individual given no liberties:

$$F(w, x) = \frac{1}{2}(1-t(1))^2 w^2 [1+(1-x)\alpha]^2 + t(1)(1-t(1))E(w^2)[1+\rho][1+(1-x)\alpha] - \frac{1}{2}(1-t(0))^2 w^2 + t(0)(1-t(0))E(w^2),$$

where the first expression is the indirect utility from  $\ell = 1, t(1)$  and the second one is the indirect utility from  $\ell = 0, t(0)$ . To see that the higher is the level of religiosity (that is, when  $x > \hat{x}(w)$ ), the more attractive is  $\ell = 0, t(0)$ , note that when we plug for  $t(0)$ , then:

$$\frac{1}{2}(1-t(0))^2 w^2 + t(0)(1-t(0))E(w^2) = \frac{E^2(w^2)}{2E(w^2) - w^2}$$

and thus the the second element in  $F$  does not depend on  $x$ , whereas the first element decreases in  $x$  as above.

Using total differentiation, and using the envelope theorem which implies that the partial derivative with respect to the taxes are 0, we have that:

$$\frac{d\hat{x}(w)}{dw} = -\frac{\frac{\partial F}{\partial w}}{\frac{\partial F}{\partial x}}$$

Note that  $\partial F/\partial x < 0$ , and  $\partial F/\partial w = \frac{1}{2}(1-t(1))^2[1+(1-x)\alpha]^2 - \frac{1}{2}(1-t(0))^2 < 0$  as  $t(1) > t(0)$ . Thus,  $\frac{d\hat{x}(w)}{dw} < 0$ . ■

**Proof. of Proposition 11**

Taking a derivative of the indirect utility of the high productive secular group according to  $\sigma$  when  $\ell = 1$  and  $t = \frac{\lambda_l(1+\rho)-(2-x_s)}{2\lambda_l(1+\rho)-(2-x_s)}$ . The indirect utility is:

$$v_{sh} = w_h^2 \left( \frac{1}{2}(1-t)^2(2-x_s)^2 + t(1-t)\lambda_h(2-x_s)(1+\rho) \right)$$

Taking a derivative w.r.t.  $\sigma$ , evaluating it at  $\sigma = 1$ , where  $t = \frac{\lambda_l - 1}{2\lambda_l - 1}$ , and cancelling common factors, we have that (after some manipulation):

$$\begin{aligned} \text{sign} \frac{dv_{sh}}{d\sigma} \Big|_{\sigma=1} &= \text{sign} \left( \frac{\partial v_{sh}}{\partial \sigma} \Big|_{\sigma=1} + \frac{\partial v_{sh}}{\partial t} \Big|_{\sigma=1} \frac{\partial t}{\partial \sigma} \Big|_{\sigma=1} \right) \\ &= \text{sign} \left( t\lambda_h + \frac{(1-2t)(\lambda_h - \lambda_l)}{(2\lambda_l - 1)} \right) \end{aligned}$$

The first expression represents the net gain from the increase in the tax base when  $\sigma$  increases, whereas the second represents the higher tax (around the optimum) and the loss from taxation. This becomes (getting rid of common terms):

$$\begin{aligned} \text{sign} \frac{dv_{sh}}{d\sigma} \Big|_{\sigma=1} \\ = \text{sign} \left( \lambda_h - \frac{\lambda_l}{(\lambda_l - 1)(2\lambda_l - 1) + 1} \right) \end{aligned}$$

If the derivative at  $\sigma = 1$  is positive, then decreasing  $\sigma$  decreases utility, so we want it to be negative. Note that the RHS decreases with  $\lambda_l$  and it is set at 1 when  $\lambda_l = 1$  ( $\frac{w_h^2}{w_l^2} = 1$ ) in which case also  $\lambda_h = 1$  and thus the derivative is 0. On the other hand, when  $\frac{w_h^2}{w_l^2} \rightarrow \infty$ ,  $\frac{\lambda_l}{(\lambda_l - 1)(2\lambda_l - 1) + 1} \rightarrow 0$ , but  $\lambda_h \rightarrow 1 - p > 0$  so that the condition is not satisfied. Thus,  $\lambda_h$  has to be small enough compared with  $\lambda_l$  or in other words, the larger is  $\lambda_l$ , the smaller  $\lambda_h$  needs to be (which represents a larger gain from a reduction in taxation with a smaller loss in terms of the social output). This can arise if the share of the low productive types  $p$  is sufficiently large, or, for such fixed share, when the parameter of earning capacity inequality  $\frac{w_h^2}{w_l^2}$  is not too large as illustrated above. ■

## References

Barro, Robert and Rachel McCleary (2003). "Religion and Economic Growth across Countries", *American Sociological Review*. 68:760-81.

Becker, Sasha and Ludger Woessmann (2009). "Was Weber Wrong? A Human Capital Theory of Protestant Economic History." *Quarterly Journal of Economics*. 124:531-596.

Bénabou Roland, Davide Ticchi and Andrea Vindigni (2013), "Forbidden Fruits: The Political Economy of Science, Religion, and Growth", working paper.

Benabou, Roland and Jean Tirole (2006). "Belief in a Just World and Redistributive Politics." *Quarterly Journal of Economics*. 121:699-746.

Berman, Eli (2000). "Sect, Subsidy and Sacrifice: An Economist's View of Ultra-Orthodox Jews." *Quarterly Journal of Economics*. 115:905-953.

Brañas-Garza Pablo & Antonio M. Espín & Shoshana Neuman, 2013. "Effects of Religiosity on Social Behaviour: Experimental Evidence From a Representative Sample of Spaniards," Working Papers 2013-07, Department of Economics, Bar-Ilan University.

Campante, Filipe, and David Yanagizawa-Drott (2013), "Does Religion Affect Economic Growth and Happiness? Evidence from Ramadan", working paper.

Carvalho, Jean-Paul and Mark Koyama (2012), "Development and Religious polarisation: The Emergence of Reform and Ultra-Orthodox Judaism.", mimeo, George Mason University.

Clark, A., and O. Lelkes, 2004. Deliver Us From Evil: Religion as Insurance. Mimeo, DELTA, Paris.

Darnell, Alfred and Darren E. Sherkat. 1997. "The Impact of Protestant Fundamentalism on Educational Attainment." *American Sociological Review* 62:306-316.

De La O, Ana, and Jonathan Rodden. "Does Religion Distract the Poor? Income and Issue Voting Around the World." *Comparative Political Studies* 41(2008): 437-76.

Dilmaghani Maryam (2012), "Religiosity, human capital return and earnings in Canada", *International Journal of Social Economics* Vol. 39 No. 1/2, pp. 55-80.

Elgin Ceyhun, Turkmen Gokselz and Mehmet Y. Gurdal (2010), "Religion, Income Inequality, and the Size of the Government", working paper.

Gill, A. and E. Lundsgaarde, 2004. State Welfare Spending and Religiosity: A Cross-National Analysis, *Rationality and Society* 16 (4), 399-436.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales (2006). "Does Culture Affect Economic Outcomes?" *Journal of Economic Perspectives*. 20:23-48.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales (2003). "People's opium? Religion and economic attitudes." *Journal of Monetary Economics*. 50:225-282.

Huber, John and Piero Stanig (2011), "Church-State Separation and Redistribution", *Journal of Public Economics* 95(7-8):828-836.

Huber, John and Piero Stanig (2007). "Religious belief, religious participation, and social policy attitudes across countries." working paper, Columbia University.

Iannaccone, Laurence (1992). "Sacrifice and stigma: reducing free-riding in cults, communes and other collectives," *Journal of Political Economy*. 100:271-291.

Lehrer, E.L., 1995. The Effects of Religion on the Labor Supply of Married Women. *Social Science Research*, 24: 281-301.

Levy, Gilat and Ronny Razin (2012). "Religious Beliefs, Religious Participation and Cooperation.", *American Economic Journals: Microeconomics*. 4:121-151.

Palani, P., 2008. The Effect of Religiosity on Income Inequality, *Journal of Politics and International Affairs*, 2008, 61-70.

Rees, T. J., 2009. Is Personal Insecurity a Cause of Cross-National Differences in the Intensity of Religious Belief?, *Journal of Religion and Society*, 11, 1-17.

Scheve, Kenneth and David Stasavage (2006). "Religion and Preferences for Social Insurance." *Quarterly Journal of Political Science*. 1: 255-286.

Weber, Max (1904). *The Protestant Ethic and the Spirit of Capitalism*. New York: Scribners.