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***DEVELOPMENT ECONOMICS, LABOUR  
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# LIBERTY, RELIGIOSITY, AND EFFORT<sup>†</sup>

## Abstract

In this paper we study the role of religiosity and individual liberties in influencing the choice of labor effort. To a standard model with consumption and effort, we add a third (public) good: civil liberties with a cap established by law. We assume that the higher the degree of religiosity of an individual the less he likes liberties, such as divorce, abortion, gender parity, or gay marriage. With standard assumptions on individual preferences, our model implies that individual labor supply is decreasing in the level of personal religiosity and that this negative relationship is enhanced by the width of liberties. We show empirically that this holds and that the size of the effect is large. Specifically, we construct an index of civil liberties and find solid evidence in support of the joint effect of religiosity and liberties on labor effort.

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# 1 Introduction

Recent literature has started exploring the effect of culture on economic outcomes.<sup>3</sup> This paper adds to this literature by considering the effect of religiosity on individual preferences and hence on labor supply. Specifically, we study the joint effect of *religiosity* and the availability of *civil liberties* on individual effort.

Religion shapes individual preferences, specifically preferences on civil liberties. Indeed all religions prohibit some or all forms of civil liberties and the fact that there are or have been legal caps on such liberties is consistent with a long history of political pressure from religious groups on these issues.

To a standard two-good model of individual choice on consumption and effort, we add a third (public) good: civil liberties, such as divorce, abortion, gender parity, LGBT rights, euthanasia, and so on. How much of these civil liberties can be used is established by law. In addition to their earning capacity, individuals are endowed with a given degree of religiosity. We assume that the stronger the degree of religiosity the deeper is the distaste for liberties.

Except for the specific influence of religiosity in the valuation of liberties, we assume that all individuals share the same preferences. We make the standard assumption of positive cross derivatives in utility, from which it follows that wider liberties increase the marginal utility of consumption to seculars, and decrease it to religious. In our model this is the reason why religious people give low value to material consumption (another common feature of religiosity): their negative valuation of civil liberties makes material consumption less enjoyable.<sup>4</sup>

We obtain the following two main predictions. First, that under some conditions, for a fixed maximum level of individual liberties allowed by law, labor supply is decreasing in religiosity. Second, this negative relation is steeper the higher the level of liberties afforded.

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<sup>3</sup>See for example Fernandez and Fogli (2009) and Fernandez et al. (2004) who obtain that economic choices for second generation immigrants can be explained by the culture of their country of ancestry. Guiso, Sapienza and Zingales (2003, 2006) find that christian religions facilitate growth and that culture has a strong influence in economic performance.

<sup>4</sup>Many religions advocate modesty and puritanism, as exemplified by monks in both Christianity and Eastern religions. 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’.”

The negative impact of religiosity on labor supply is attested by abundant empirical literature. Becker and Woessman (2009), Clark and Lelkes (2005), Berman (2000), Lehrer (1995), among others, find that religiosity has a negative effect on labor supply. At the aggregate level Barro and McCleary (2003) show that economic growth is negatively related to church attendance, but positively to religious beliefs in heaven and hell. Campante and Yanagizawa-Drott (2013) show that longer Ramadan fasting has a negative effect on output growth in Muslim countries. 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.

Our paper adds to this literature by unravelling a specific mechanism through which labor supply is affected: it is through the adverse preferences for individual liberties. We then test empirically the prediction that religiosity interacted with liberties is a key factor explaining labor supply. The results are in line with the theory, statistically significant and the size of the effect is large. An increase of one standard deviation in the intensity of religious beliefs is associated with a decrease of 0.34 weekly work hours on average for a "median" level of liberties, and a decrease of 2 weekly hours of work on average for a high level of liberties. We also find that when liberties are very low, religious and secular behave in a similar way, as predicted by the theory. Finally, we directly test the assumptions of the model and show their validity: religiosity is associated with less tolerant attitudes towards liberties, and the marginal utility of consumption is negatively related to liberties for religious individuals.

To test our predictions we construct an index of civil liberties by country based on the legal evolution of civil liberties from 1960 to 2013. The data reflects legislation on abortion, divorce, women's rights, LGBT rights and Euthanasia, and is assembled from various sources such as the UN, the EU parliament, World Bank, the Human Rights project, Pew Research Center, Freedom to Marry, etc. We use a lagged index taking into consideration that individuals' important choices in life such as education and family-related decisions are taken relatively early in life and are difficult to reverse.

The individual level data on religiosity and other individual controls are derived from the European Social Survey (ESS), where we use data from 6 waves (2002, 2004, 2006, 2008, 2010 and 2012) and 34 European countries. We regress the individual (and the desired) number of

hours worked on individual measures of religious affiliation and religious intensity, their interaction with the index of civil liberties, as well as standard individual controls. To tackle endogeneity, as some unobservable traits may affect both religious intensity and labor outputs, we construct an instrument for religious intensity. Specifically, as religiosity is a cultural trait shared by people over and above national borders, our instrument for religious intensity is derived by computing the average religious intensity of people of the same sex, age bracket and religious denomination that live in neighbouring countries. We also conduct many robustness checks, as well as provide empirical support for the mechanism suggested in the theoretical section.

Besides one's own level of religiosity we also highlight in our model the fact that allowing civil liberties to all may be viewed by religious individuals as a negative externality. The legalisation of gay marriage or abortion, for instance, seems to have an impact on individual utility independently of personal use. The externality effect of liberties can be viewed as a cultural factor specific to each religion. At one extreme we may have for instance the radical interpretations of Islam for which 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 are the forms of Protestantism that focus on the personal relationship with god, independently of what the others might be doing. In our model, religions that are more individualistic could induce a less negative effect of legal caps on labor effort. Hence, differences across religions in the weight assigned to the externality of liberties could explain differences in individual and aggregate labor effort. This would provide an explanation complementary to Weber's (1904) as to why Protestantism became more conducive to growth than Catholicism. There have been other explanations in the literature on the channels through which different religions could influence output. On this respect, Carvalho and Koyama (2012) illustrate how religions choose their cultural restrictions strategically to induce labor and capital contributions in the face of exogenous changes to economic development. Benabou, Ticchi and Vindigni (2013, 2015) look at how religious censorship might affect innovation and scientific progress and hence total output. Benabou and Tirole (2006) argue that religions may affect differently belief manipulation and hence effort.

Our contribution to the literature is therefore as follows. First, we introduce a model in which religiosity influences the preferences over individual liberties and show how this leads to lower effort. Second, we construct a new index of civil liberties. Third, we empirically show that

the interaction of the level of liberties with the personal degree of religiosity is negatively related to labor effort and that this is enhanced by the width of civil liberties.

The paper is organised as follows. We start with the description of our model, followed in Section 3 by the implications for labor supply. Section 4 deals with the data and the empirical strategy and Section 5 provides the main empirical results. Section 6 discusses whether the same results could be obtained through different alternative channels and Section 7 provides some concluding remarks.

## 2 The model

There are three goods which individuals can potentially enjoy: two are private goods, consumption  $c$  and leisure  $l \in [0, 1]$ . To obtain consumption, individuals would need to exert effort which is defined as  $e = 1 - l$ . There is also a public good, liberties  $\ell \in [0, \ell_M]$ . 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  $[0, \ell_M]$ .

The legal cap on liberties has two effects. First, it establishes the limit to what is accessible to individuals. Second, it may produce an externality because individuals may dislike to be in a society where some liberties are permitted, independently of whether or not they will personally use them. We represent the effect of liberties on an individual as the sum of the personal use of them,  $\ell$ , and the maximum legally permitted,  $\ell_M$ , this being multiplied by the parameter  $\alpha \in [0, 1]$  that indicates the weight assigned to the externality effect. The value of  $\alpha$  is specific to the religious affiliation of the individual (including secularism).

We assume that religiosity moulds individual preferences, as in Guiso et al (2006), or Benabou et al (2015). In our case, religiosity influences the valuation of individual liberties. Individuals are endowed with a “religiosity” index  $x \in [0, 1]$ . We parametrise the difference in the individual preferences over liberties by assuming that the utility function over consumption, liberties, and leisure, can be written as

$$u\left(c, (\bar{x} - x)[\ell + \alpha\ell_M], 1 - e\right), \quad (1)$$

where  $u(\cdot, \cdot, \cdot)$  is common to all individuals and  $\bar{x}$  is the threshold level of religiosity separating

those that value liberties positively with  $x \leq \bar{x}$  (we call them *secular*) from those that value them negatively, with  $x > \bar{x}$  (the *religious*). Notice that the higher the degree of religiosity the lower the valuation of liberties. In addition, as we have already mentioned, we allow religious and secular to also differ in the importance attached to the externality effect of the legal cap,  $(\alpha_R, \alpha_S)$ .<sup>5</sup>

We assume the standard properties on  $u(\cdot, \cdot, \cdot)$ : the utility function increases in all arguments, satisfies concavity with respect to each argument, and has non-negative cross derivatives. Notice that these properties together with the parametric representation of preferences imply that the marginal utility of liberties can be positive or negative, depending on whether the individual is secular or religious.

Let us start with the choice of individual liberties  $\ell \in [0, \ell_M]$ . Since liberties are a free (public) good, it is immediate that the optimal individual choice will consist of choosing either  $\ell = \ell_M$  if  $x \leq \bar{x}$  or  $\ell = 0$  if  $x > \bar{x}$ .<sup>6</sup> Therefore, the individual liberties component will be either  $(1 + \alpha_S)\ell_M$  for secular individuals or  $\alpha_R\ell_M$  for religious individuals. Given this, and in order to simplify on notation, we will from now on use  $\ell$  for the legal cap  $\ell_M$ . Therefore, taking into account this choice, effort  $e$  and consumption  $c$  will solve the constrained maximisation of

$$u(c, \Lambda_i, 1 - e), \quad i = S, R.$$

where  $\Lambda_S = (\bar{x} - x)(1 + \alpha_S)\ell$  and  $\Lambda_R = (\bar{x} - x)\alpha_R\ell$  are the interaction parameters of religiosity with the civil liberties component.

Recall that the  $u$  function is common to all and that  $\Lambda_S > \Lambda_R$ . Hence, because of the assumed positive cross derivatives of  $u$ , religious individuals will have a lower marginal utility of consumption, all equal. This low appreciation for material consumption, often associated with religiosity, is derived from primitive assumptions on preferences rather than posited.

Besides their level of religiosity, individuals are also characterised by their earning capacity  $w$ . Earned income  $we$  is entirely consumed, so that  $c = we$ . Plugging the budget equality in the utility function we have

$$u(we, \Lambda_i, 1 - e), \quad i = s, r,$$

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<sup>5</sup>We are taking the liberty of denoting as “secular” the individuals with  $x \leq \bar{x}$  and “religious” the ones with  $x > \bar{x}$ . In the empirical section of the paper we indeed find that religiosity is highly significant in explaining attitudes towards individual liberties.

<sup>6</sup>In order to avoid vacuous complications we assume that the individuals with  $x = \bar{x}$  choose maximum liberties.

so that given the unconditioned choice of liberties by each individual, utility depends on the choice of  $e$  only. Differentiating we have

$$\frac{du}{de} = wu_c(we, \Lambda_i, 1 - e) - u_l(we, \Lambda_i, 1 - e), \quad i = s, r.$$

Differentiating again with respect to  $e$  we have

$$\frac{d^2u}{de^2} = w^2u_{cc}(we, \Lambda_i, 1 - e) - 2wu_{cl}(we, \Lambda_i, 1 - e) + u_{ll}(we, \Lambda_i, 1 - e) < 0, \quad i = s, r.$$

Therefore, the optimum level of effort  $e$  is the one solving  $\frac{du}{de} = 0$ .

### 3 Religiosity and individual labor supply

We now examine the relationship between labor supply  $e$  and religiosity  $x$ . Totally differentiating the first order condition with respect to  $e$  and with respect to  $x$  we have

$$\frac{de}{dx} = -\frac{\frac{d^2u}{ded\Lambda_i}}{\frac{d^2u}{de^2}} \frac{d\Lambda_i}{dx}.$$

As  $\frac{d^2u}{de^2} = u_{ll} < 0$ , the denominator is negative. Moreover, we know that  $\frac{d\Lambda_i}{dx} < 0$ . As for the term in the numerator, we can easily obtain that

$$\frac{d^2u_i}{ded\Lambda_i} = u_l \left[ \frac{u_{c\Lambda}}{u_c} - \frac{u_{l\Lambda}}{u_l} \right].$$

Therefore the sign of  $\frac{de}{dx}$  is given by the difference between two positive terms (that can be interpreted as monotonic transformations of elasticities) and it depends on which is largest. An increase in religiosity  $x$  decreases the marginal utility of consumption –and this induces less effort– but it also decreases the marginal utility of leisure –which induces more effort. The net result from the two effects depends on which term is largest and this is an empirical matter.<sup>7</sup> Our empirical results strongly support the assumption that there are no complementarities between leisure and

<sup>7</sup>Note that religious and secular individuals differ substantially in how they spend their leisure, and religions often prescribe very specific ways in which leisure time should be spent (e.g., performing rituals, reading the Bible, not working on the Sabbath, etc.). As a result, it is not obvious what is the right assumption in terms of the marginal utility of leisure as a function of liberties and the degree of religiosity.

religiosity.

Let us bring together these observations in the following proposition:

**Proposition 1** *Let  $\frac{u_{c\Lambda}}{u_c} > \frac{u_{l\Lambda}}{u_l}$ . The effects of religiosity and liberties on labor supply are as follows:*

*[i] Labor supply depends on the interaction of religiosity and liberties  $\Lambda_i$  and is strictly decreasing in religiosity  $x$ .*

*[ii] An increase in the legal cap on liberties  $\ell$  increases (decreases) effort of secular (religious) individuals.*

Our model provides 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>8</sup> Besides the explicit derivation from fundamentals, the model delivers the new, testable implication that this effect is enhanced by the legal level of individual liberties. This result is supported by our own empirical analysis presented in the rest of the paper. In this analysis we will also provide direct evidence to validate the assumptions -and premise- behind Proposition 1 (see Section 6).

## 4 Empirical Analysis: Data and empirical strategy

We now explore empirically the implications of the theory. In this section we introduce the data, the variables employed in the empirical analysis, our specific testable hypotheses, as well as our empirical strategy. The main results of the empirical analysis are presented in Sections 5 and 6.

### 4.1 Data and variables

#### 4.1.1 Individual-level data

We use individual-level data from the European Social Surveys (ESS). We consider all rounds (2002, 2004, 2006, 2008, 2010 and 2012) and all countries available (at most 34). The surveys focus on European countries and also contain information for Turkey and Israel.<sup>9</sup> This results in a large raw

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<sup>8</sup>Besides the empirical findings by Clark and Leikes (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.

<sup>9</sup>The countries in the sample are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Netherlands,

dataset of more than 200,000 observations. We have dropped from the sample full-time students, retired people and individuals with permanent disabilities. In addition, we've also dropped people being born abroad as they can have been exposed to a different legislation on civil liberties. In what follows we describe how we have used the information of the ESS to obtain proxies for our variables of interest. Detailed definitions as well as tables of summary statistics are provided in Appendix A.

**Religiosity.** The ESS contain information both on religious *affiliation* and on religious *intensity*.  $REL_{AFF}$  is a dummy that measures current religious affiliation while  $REL_{EVER}$  is equal to 1 if the respondent currently belongs or has belonged in the past to a religion and zero otherwise. The correlation between these two variables is, not surprisingly, very high (.82) as only 8% of the people in our sample declare not to belong to a religion but to have belonged in the past.<sup>10</sup>

Three variables in the ESS capture different dimensions of religious intensity.  $PRAY$  measures respondent's monthly frequency of praying,  $RELIGIOSITY$  is self-reported degree of religiosity, and  $RELIGIOUS\ ATTENDANCE$  reports respondent's monthly frequency of attendance to religious services. All variables have been renormalized so that they are all measured on a scale from 0 to 1. We construct an index of individual religiosity,  $REL_{INT}$ , by computing the simple average of the above-mentioned variables. Using principal components instead of a simple average delivers virtually identical results.

**Effort.** Our main dependent variable is the log of the number of hours worked per week (in main job), excluding any paid or unpaid overtime ( $HOURSWORKED$ ). In the robustness checks section, we also consider the total amount of the log of hours worked, including overtime ( $TOTALHOURS$ ). Notice, however, that both  $HOURSWORKED$  and  $TOTALHOURS$  are imperfect measures of the willingness to work, as they reflect *attitudes* towards effort as well as the characteristics of the environment (i.e., rigidity of the labor market). To address this issue, we also consider a variable that reports the log of the number of hours that the respondent would like to work ( $DESIREDHOURS$ ). Unfortunately, this variable is only contained in two of the rounds of the ESS so the sample size reduces considerably.

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Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and United Kingdom.

<sup>10</sup>Among the 281,297 respondents of the ESS, 23,691 have changed their religious affiliation.

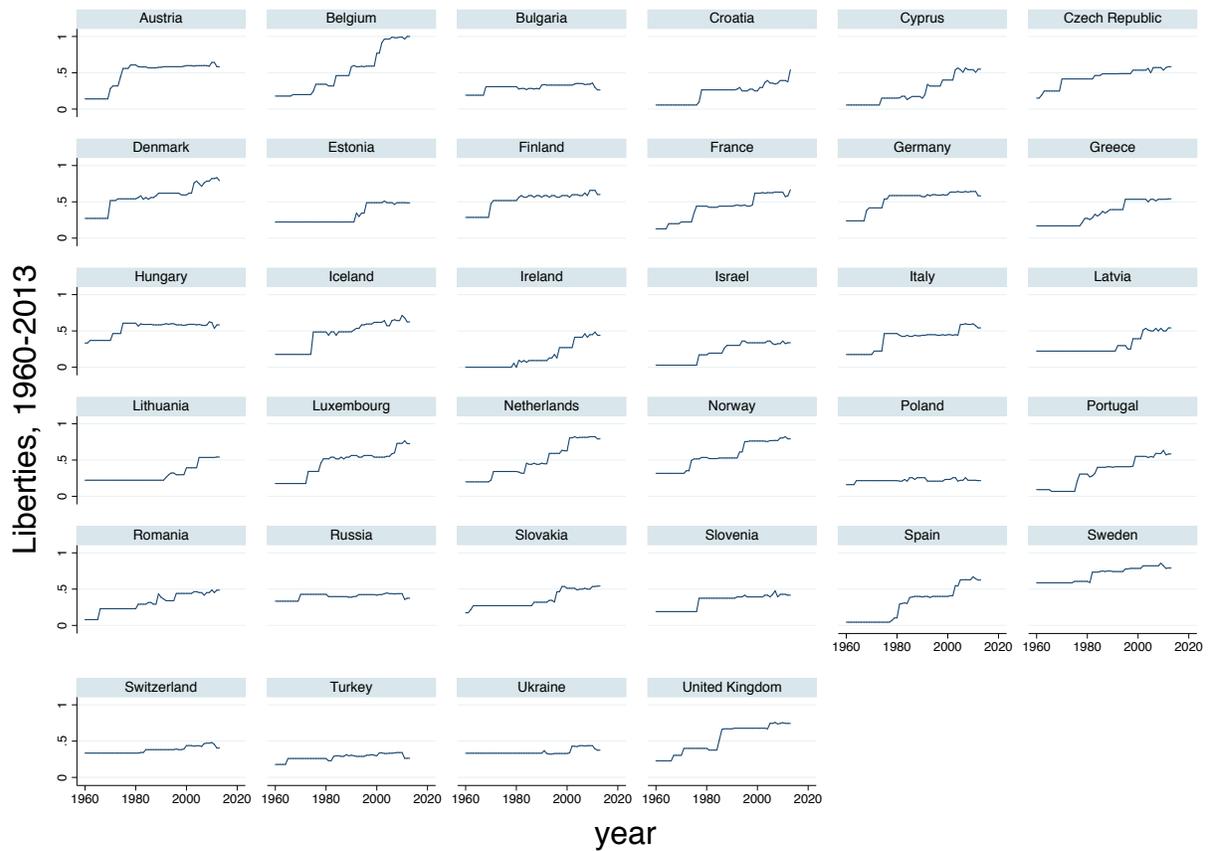


Figure 1: Legal evolution of the civil liberties index, 1960-2013

**Individual controls.** We use a list of standard controls: age (AGE) and age squared (AGE<sup>2</sup>), gender (GENDER), whether the respondent lives with a partner (COHAB), years of completed education (EDUYRS), a subjective measure of own’s health (HEALTH), whether there are children in the household (CHILDREN), the size of the household (HHSIZE) and a measure of partner’s education (EDU-PTNR).

#### 4.1.2 Civil liberties

We have collected data on 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, LGBT rights, and Euthanasia. Data comes from a number of sources such as the UN, the EU parliament, World Bank, Human Rights project, Pew Research Center, Freedom to Marry, etc. We first create an index

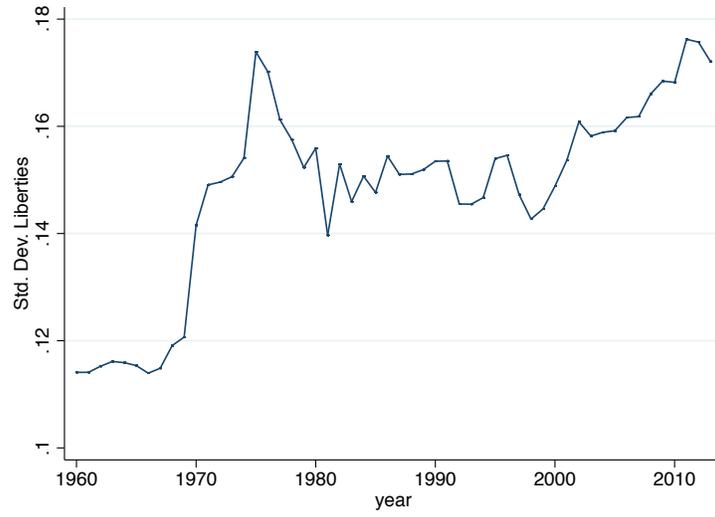


Figure 2: Cross-country std. deviation of the civil liberties index, 1960-2013

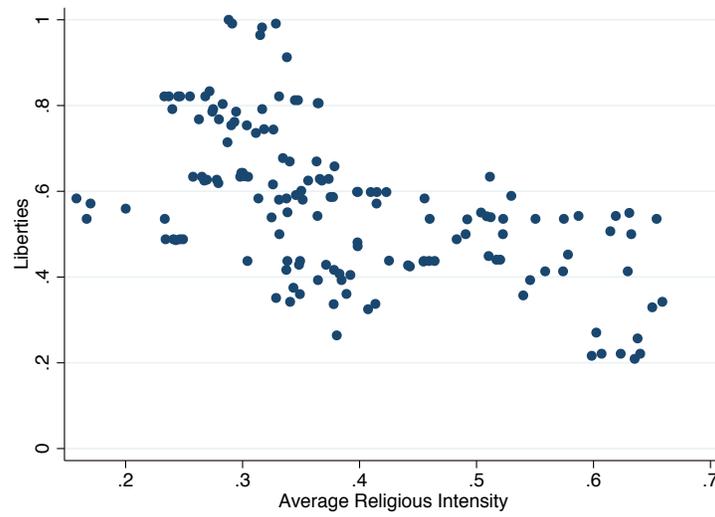


Figure 3: Liberties index and average religious intensity

of liberties for each individual issue. To this effect, we have looked at each point in time at the legislation on that issue in a number of dimensions. For instance, to elaborate the LGBT rights index we have coded for each year from 1960 to 2013 whether it is legal to maintain a sexual relationship with someone of the same sex, whether a same-sex union and/or marriage is legal and whether same-sex parents are allowed to adopt. We then calculate our index of civil liberties as the simple average of the individual indices. See Appendix A for additional details on its construction.

Figure 1 displays the evolution of the index of civil liberties in Europe from 1960 to the present while Figure 2 depicts its cross-country standard deviation for each of the years of the 1960-2013 period. Despite the fact that we focus exclusively on European countries, both figures reveal substantial variability both over time and across countries. The most conservative countries according to our index are Ireland (with an average value of the index of .15), Israel (.20) and Poland (.21). On the other side of the spectrum, the most liberal countries are Sweden at the top (.70 on average), followed by Norway and Denmark (.56). As for temporal evolution, the value of the index was relatively low and homogeneous across European states during the 60's. The 70's witnessed an important increase in the variability of the index, reflecting the legal changes occurring in some, but not all, of the countries in the dataset. During the 80's and 90's most of the countries in the sample kept introducing legal reforms so the variability of the index decreased as countries started to catch up. A new liberalisation wave in the 2000's has led the variability of the index to a new maximum.

Finally, Figure 3 displays the value of the Liberties index versus average religious intensity by country and survey wave (i.e., there are 6 time points for each country). The graph shows that, not surprisingly, there is a negative correlation between religiosity and liberties (the correlation is equal to -0.56).

### **Operationalising the Civil Liberties index**

The next step is to construct a variable that summarises individual access to civil liberties. To construct an individual-specific index we exploit the following idea. Many education, work and family-related decisions are taken early in life and are difficult to overturn later on. For instance, a woman's decision of not going to college and stay at home, or fertility decisions would be difficult to overturn if the legal context regarding female participation in the labor market changes

substantially 30 years later. Thus, as family and education decisions are taken early in life and are extremely persistent, we should expect that individuals are more responsive to the level of afforded liberties at the time when these decisions are made.

To implement this idea, we construct individual-specific indicators that reflect the level of liberties at different stages of the individual's life cycle. To that effect, we average the values of the liberties index corresponding to the years when that individual was between 18 and  $G$  years of age, with  $G = \{40, 50 \text{ and } 60\}$ . We label the resulting index as  $LIB_G$ . In our baseline analysis we use the intermediate value,  $LIB_{50}$ , and show that results are robust to using the other  $G$  as well.<sup>11</sup>

## 4.2 Empirical strategy

Identifying the economic impact of cultural factors is, in general, a difficult task and empirical work is often plagued by identification problems, see Guiso et al. (2003, 2006) for a summary of the main challenges faced by this literature. Some of these problems include the endogeneity of cultural traits, the difficulty of controlling for all the relevant variables (which leads to omitted variable bias), and the fact that most studies focus on the relation between religiosity and economic *outcomes*, not *attitudes*.<sup>12</sup> To overcome these problems, our empirical strategy is constructed around the following points.

First, we control for country and survey fixed effects in all our specifications. Introducing country dummies allows us to eliminate the impact of (slowly-moving) institutional variables and reduce in this way the risk of omitted variable bias. The drawback of this approach is that, as religiosity is at the very core of the nation's culture in many instances, the country dummies can partially absorb the impact of religion. Thus, our estimates can be interpreted as a lower bound of the effect of religiosity on effort. By introducing survey fixed effects we are also able to control for time-varying global shocks, such as global economic trends.

Second, we follow two approaches to overcome the potential endogeneity of the intensity of religious beliefs. The first one introduces a new instrument for religious intensity, see Section 4.3 below for a detailed explanation. We examine extensively the validity of our IV strategy, including robustness checks to the violation of the exclusion restriction (see Appendix B). The second ap-

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<sup>11</sup>We have also checked  $G = 30$  and the results are robust.

<sup>12</sup>Outcomes are the result of attitudes but also of the surrounding institutional and individual environment.

proach consists of using religious affiliation (current or past) as a proxy for the intensity of religious beliefs. Religious affiliation is largely inherited from previous generations. As mentioned earlier, only around 8% of the respondents in the ESS sample have changed their religious affiliation. It follows that this cultural trait can be taken largely as given to individuals (Guiso et al., 2003) and, thus, it can be considered to be independent of individual characteristics and experiences.

Third, we consider two types of dependent variables: the *effective* number of hours worked and the *desired* number of hours worked. The first one is an economic *outcome* and reflects both the willingness to work as well as country-specific labor market characteristics and personal constraints. The second variable reflects individual *attitudes* towards effort and it allows to identify in a cleaner way the effect of religious beliefs on people's preferences as it is less constrained by individual and country characteristics.

Fourth, we also examine empirically the *channels* linking religiosity and effort. Religions preach the condemnation and stigma of the use of various liberties shaping individual preferences on these issues. Our theory stresses the complementarity between consumption and liberties, which makes religious people to have lower (net) marginal utility of consumption and thus, less incentives to work. In our empirical exercise we will directly explore whether religious individuals: 1) dislike liberties; 2) value an increase in consumption (or in leisure) less than seculars with a gap that increases with the amount of liberties afforded.

### 4.3 Instrumenting religious intensity

As mentioned earlier, the intensity of religious beliefs is likely to be endogenous. Religious *intensity* is voluntarily accumulated by individuals rather than “inherited”, as is the case of religious affiliation. There are (at least) two types of omitted variables in our regressions that can have a direct impact on effort and at the same time be correlated with the intensity of religious beliefs, giving rise to an endogeneity problem. Two such variables are unobserved individual characteristics and country-specific time-varying institutional factors. An example of the latter would be a negative economic shock that can lead to unemployment and to an increase in  $REL_{INT}$  if the newly available free time is employed in religious activities.

To construct an instrument for  $REL_{INT}$ , we exploit the fact that religiosity is a cultural trait

that transcends national borders. That is, people belonging to a particular religious denomination share an important part of their culture with people of the same denomination living in other countries. In particular, they are likely to have similar beliefs and attitudes towards topics regulated by their religions. We construct an instrument for  $\text{REL}_{\text{INT}}$ ,  $\text{REL}_{\text{INT}}^{\text{IV}}$ , as follows: for an individual  $i$  from country  $j$  with (current or past) religious denomination  $r$ , we consider the people of the same religious denomination, gender and age bracket living in the countries that share a border with country  $j$ .<sup>13</sup> We consider neighbouring countries so that similarities between national customs are more pronounced. Next, we compute the average value of  $\text{REL}_{\text{INT}}$  for those individuals. The resulting quantity is the value of  $\text{REL}_{\text{INT}}^{\text{IV}}$  for individual  $i$  in country  $j$ .

As the instrument is the average of other people’s religiosity, by construction it is uncorrelated with individual  $i$ ’s unobserved characteristics, as long as religious affiliation can be considered exogenous. Also, the instrument is uncorrelated with country-specific institutional variables and shocks to country  $j$  as it is computed using data from neighbouring countries (recall that global shocks are captured by the survey dummies).

As in any IV analysis, we cannot entirely exclude the possibility that our instrument violates the exclusion restriction. This would be the case, for instance, if religious affiliation is not exogenous or if shocks across neighbouring countries are correlated. Appendix B examines the robustness of our empirical results to violations of the exclusion restriction and shows that our conclusions are quite robust to deviations from this hypothesis.

#### 4.4 Empirical specification and hypotheses

Our main goal is to test the implications of Proposition 1, namely, that labor supply depends on the interaction between religiosity and liberties and that liberties increase effort for seculars but decrease it for religious. It seems natural to use a linear specification to test these claims. To provide further intuition on the type of preferences that generate a linear relationship between the key variables of interest, consider the following specification

$$u(c, \Lambda_i, l) = c \left[ 1 + \Lambda_i \right] - \frac{1}{2} e^2.$$

---

<sup>13</sup>We define three age brackets: from 18 to 35, from 36 to 60 and from 60 onwards. Results are robust to changes in the definition of the brackets.

Since leisure is additively separable from liberties and consumption, this specification of the preferences satisfies the conditions of Proposition 1. To simplify further the empirical specification, we assume that  $\alpha_R=1$  and  $\alpha_S=0$ . This is a particular way of capturing the fact that the externality effect is likely to be larger for religious than for secular. Secular are favourable to liberties because they will make use of them and hence do not need to attach a huge value to the externality of the legal cap as such. In contrast, although religious individuals are free not to use whatever liberties are afforded, they are often intensely engaged in active [sometimes even violent] lobbying against such liberties. This can only be rationalised by a very large weight on the externality effect of the legal cap on liberties. This assumption implies that  $\Lambda_i = (\bar{x} - x)\ell$ , the same expression for religious or secular (but with different signs), obviously depending on  $x$ .

Under these assumptions, it is easy to show that optimal effort is given by

$$e = w[1 + (\bar{x} - x)\ell].$$

Taking logs and using the approximation  $\log(1 + (\bar{x} - x)\ell) \approx (\bar{x} - x)\ell$ , which is valid if  $x$  is in a neighbourhood of  $\bar{x}$ , it follows that<sup>14</sup>

$$\log(e) = \log(w) + \bar{x}\ell - x\ell. \quad (2)$$

Our empirical specification follows equation (2), which suggests a linear relationship relating (the log) of effort, the legal cap of civil liberties  $\ell$ , the interaction between the degree of religiosity and the legal cap on liberties  $\ell$ , and the log of a measure of earning capacity.<sup>15</sup> We estimate the following equation:

$$\log(e_{i,j,s}) = \beta_0 + \beta_1 Rel_{i,j,s} + \beta_2 Rel_{i,j,s} \times \ell_{i,j,s} + \beta_3 \ell_{i,j,s} + X'_{i,j,s} \beta + \gamma Z_j + \delta Y_s + \epsilon_{i,j,s}, \quad (3)$$

where  $i$  and  $j$  and  $s$  denote individual, country and survey year, respectively, Rel is a proxy of individual religiosity ( $x$ ),  $\ell$  is the individual-specific index of liberties (LIB<sub>G</sub>),  $X$  contains individual controls, and  $Z$  and  $Y$  are country and survey dummies, respectively. As  $\log(w)$  is not observed, it

<sup>14</sup>Since the range where  $x$  moves is arbitrary it is possible to renormalise it so that this approximation can be applied.

<sup>15</sup>Using the variables instead of their logs does not have any effect on the results.

is in the residual term.

Differentiating this equation with respect to  $\ell$  and  $Rel$ , we obtain

$$\partial \log(e_{i,j,s}) / \partial \ell_{i,j,s} = \beta_3 + \beta_2 Rel_{i,j,s} \quad (4)$$

$$\partial \log(e_{i,j,s}) / \partial Rel_{i,j,s} = \beta_1 + \beta_2 \ell_{i,j,s} \quad (5)$$

Our theory implies that  $\beta_2 < 0$  and  $\beta_3 > 0$ , that is, the marginal impact of an increase in the cap on liberties  $\ell$  on effort is positive for low levels of religiosity but it becomes negative when religiosity is high. The turning point of this equation allows us to identify  $\bar{x}$ , the threshold separating religious and seculars, which is given by  $\bar{x} = -\beta_3/\beta_2$ . We'll use the estimated coefficients to identify the value of  $\bar{x}$ . Also, in order to check whether our estimates are reasonable, we'll compare the obtained threshold with direct information on attitudes towards liberties contained in the ESS data. A final implication of our theory is that expression (5) is smaller than zero for positive levels of liberties, that is, the marginal effect of religiosity on effort is overall negative.

## 5 Religiosity, liberties and effort

This section presents our empirical results relating effort, religiosity and liberties. Table 1 contains our main results. The first 5 columns are estimated by OLS while the second 5 by two stage least squares (2SLS). Column 1 regresses HOURSWORKED on religious intensity ( $REL_{INT}$ ), liberties ( $LIB_{50}$ ), some exogenous individual characteristics (gender and age) and country and survey dummies. The coefficient of  $REL_{INT}$  is negative and significant suggesting that effort is decreasing in religious intensity. The effect of  $LIB_{50}$  on effort is not significantly different from zero, in accordance with our theory that predicts that liberties foster or hinder effort depending on the degree of individual religiosity. Column 2 adds the interaction of religiosity and liberties to a specification otherwise identical to that of column 1. The coefficient of the interacted term is negative and highly significant, as expected. On the other hand, the effect of  $REL_{INT}$  is now positive and significant suggesting that for moderate values of  $LIB_{50}$  the net effect of  $REL_{INT}$  is ambiguous. We'll examine this point in detail below. The coefficient associated with  $LIB_{50}$ , that now captures the effect of liberties on effort when  $REL_{INT}$  is close to zero, is positive and significant as our theory predicts. Columns 3 and

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
REL <sub>INT</sub>	-0.039*** (0.007)	0.100*** (0.010)	0.111*** (0.005)	0.107*** (0.008)	0.128*** (0.006)	-0.044 (0.117)	0.165 (0.126)	0.175 (0.102)	0.178 (0.103)	0.219* (0.086)
REL <sub>INT</sub> × LIB <sub>50</sub>		-0.299*** (0.001)	-0.306*** (0.001)	-0.297*** (0.001)	-0.345*** (0.001)		-0.439* (0.055)	-0.441* (0.050)	-0.445* (0.054)	-0.560** (0.040)
LIB <sub>50</sub>	0.041 (0.573)	0.147* (0.076)	0.152* (0.064)	0.166** (0.048)	0.248*** (0.003)	0.056 (0.443)	0.203* (0.067)	0.209* (0.057)	0.219** (0.044)	0.329*** (0.005)
AGE	0.005** (0.013)	0.006*** (0.005)	0.007*** (0.000)	0.007*** (0.000)	0.005*** (0.007)	0.005** (0.023)	0.005*** (0.007)	0.007*** (0.000)	0.007*** (0.000)	0.005*** (0.009)
AGE <sup>2</sup>	-0.000** (0.013)	-0.000*** (0.004)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.003)	-0.000*** (0.025)	-0.000*** (0.006)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.004)
GENDER	-0.166*** (0.000)	-0.166*** (0.000)	-0.166*** (0.000)	-0.165*** (0.000)	-0.187*** (0.000)	-0.165*** (0.000)	-0.166*** (0.000)	-0.166*** (0.000)	-0.165*** (0.000)	-0.186*** (0.000)
COHAB			-0.006 (0.253)	-0.006 (0.283)				-0.005 (0.417)	-0.004 (0.472)	
CHILDREN			-0.007 (0.286)	-0.007 (0.288)	-0.011 (0.202)			-0.009 (0.185)	-0.009 (0.186)	-0.015* (0.086)
HHSIZE			-0.010*** (0.003)	-0.010*** (0.001)	-0.009*** (0.007)			-0.010*** (0.003)	-0.010*** (0.002)	-0.008** (0.019)
EDUYRS				-0.001 (0.640)	-0.001 (0.372)				-0.000 (0.756)	0.000 (0.931)
HEALTH				-0.007** (0.015)	-0.006* (0.065)				-0.007** (0.018)	-0.005* (0.097)
EDU-PTNR					-0.004** (0.019)					-0.003** (0.040)
c	3.542*** (0.000)	3.481*** (0.000)	3.502*** (0.000)	3.594*** (0.000)	3.602*** (0.000)	3.691*** (0.000)	3.582*** (0.000)	3.604*** (0.000)	3.613*** (0.000)	3.595*** (0.000)
R <sup>2</sup>	0.110	0.111	0.112	0.113	0.135	0.112	0.113	0.115	0.115	0.138
Obs	144399	144399	143629	142710	96448	133663	133663	133039	132173	89254
K-P test						557	271	281	283	235
Cragg-Donald						32896	16426	15942	16290	10232
AR test						0.12	0.057	0.069	0.080	0.056

Table 1: HOURS WORKED, RELIGIOUS INTENSITY AND LIBERTIES, OLS AND 2SLS

Notes. Dependent variable is HOURSWORKED. All models contain country and survey dummies. Columns 1-5 have been estimated by OLS while columns 6-10 by 2SLS. There are 34 countries. Robust standard errors clustered at the country level have been computed. p-values are in parentheses.

4 show that the results continue to hold when other individual controls are introduced. Column 5 restricts the sample to people that cohabit and introduces the education of the partner. The results remain very similar.

As there are good reasons to believe that REL<sub>INT</sub> can be endogeneous, we have reestimated the previous equations by 2SLS using the instrument introduced in Section 4.3.<sup>16</sup> The results reported in columns 6-10 in Table 1 are qualitatively very similar to our OLS results. For the sake of brevity, we focus on the results in column 10, our baseline specification henceforth, which reestimates column 5 in the same table. We start by analysing the first stage regression. There is a strong correlation between REL<sub>INT</sub> and its instrument (around .5). At the bottom of Table 1 we report the value of the Cragg-Donald and the Kleibergen-Paap statistics for detecting weak instruments. Both statistics are much larger than their associated critical values.<sup>17</sup> However, one has to interpret this fact with caution as the large-sample validity of both tests has not being established when residu-

<sup>16</sup>We construct the instrument for the interaction term of religious intensity and liberties simply by replacing REL<sub>INT</sub> by REL<sub>INT</sub><sup>IV</sup> in the product.

<sup>17</sup>The Stock and Yogo critical values corresponding to the 10% maximal size deviation is 7.04.

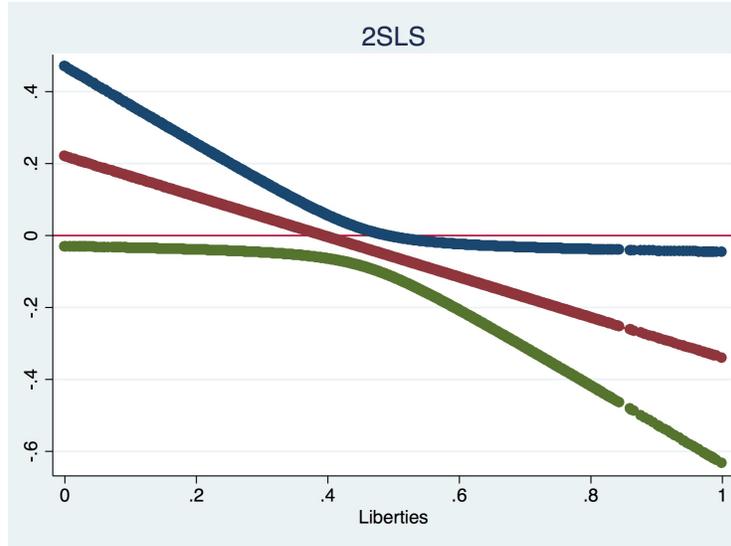


Figure 4: Mg effect of  $REL_{INT}$  on  $HOURSWORKED$  as a function of  $LIB_{50}$  (column 10, Table 1)

als are not i.i.d., something we cannot discard in our case.<sup>18</sup> To overcome this difficulty we also provide in Table 1 the p-value of the Anderson-Rubin statistic that is robust to weak instruments. This statistic tests the hypothesis that the coefficients of  $REL_{INT}$  and  $REL_{INT} \times LIB_{50}$  are jointly equal to zero. This hypothesis is rejected in all cases (with the exception of column 6, where the interaction term is not included). Table 4 provides further robustness checks that confirm that weak instruments is not a problem in our case.

As for the second stage, column 10 shows that the interaction of religiosity and liberties has a negative and significant effect on labor supply while the coefficient of religiosity is positive and marginally significant (p-value .086). As mentioned before, the net effect of religiosity is then, ambiguous, especially for moderate values of  $LIB_{50}$ . To assess the net effect, Figure 4 plots the estimate of the marginal effect of religiosity on effort as a function of  $LIB_{50}$  together with its confidence bands (at the 5% significance level). This graph shows that the effect of religiosity is positive but not significantly different from zero for moderate values of  $LIB_{50}$ . But, as  $LIB_{50}$  increases, the marginal effect becomes negative and significant. In particular, the effect is significantly different from zero for individuals with a value of  $LIB_{50}$  larger than .43 which amounts to approximately half of the people in our sample. This result is also in line with the predictions of our theory as it states

<sup>18</sup>In fact, the problem of testing for weak instruments when there are two potentially endogenous regressors and the errors are not i.i.d. is still an open question in the econometrics literature.

that the behaviour of religious and seculars *only* differs when they have access to liberties and that, otherwise, religiosity should not play any role. Finally, the effect of  $LIB_{50}$  on effort is positive and highly significant, suggesting that seculars work more when liberties are high.

The magnitude of the effect of religiosity on effort is quite sizeable when the individuals have access to liberties. Focusing again on column 10 in Table 1, an increase in one standard deviation in the intensity of religious beliefs is associated with a decrease in the number of hours worked of 1.02% (0.34 hours on average), 2.98% (1.12 hours on average) and 5.18% (1.94 hours on average) for  $LIB_{50}$  in the 50th, 75th and 95th percentile, respectively.

Finally, recall that from equation (5), the value of  $\bar{x}$ , the threshold separating religious from seculars, is given by  $\bar{x} = -\beta_3/\beta_2$ , where  $\beta_2$  and  $\beta_3$  are the coefficients associated to  $REL_{INT} \times LIB_{50}$  and  $LIB_{50}$  respectively. Using the values of these coefficients from column 10 of Table 1, we obtain a value for  $\bar{x} = .59$ . Thus, according to this value, people with a religiosity below .59 (approximately 70% of the people in our sample) can be considered as “*secular*” (i.e., they value liberties positively). As the ESS contain questions on attitudes towards several liberties, we can compare the estimated threshold with direct information on attitudes. We focus on the question addressing gay rights for two reasons. Firstly, it is the only variable reflecting attitudes towards civil liberties contained in all ESS waves. Secondly, as gay rights only affect ‘directly’ a minority of the population, it allows us to measure in a cleaner way the proportion of people that like/dislike liberties for reasons other than the direct use of this liberty. The proportion of people in our sample that support gay rights (i.e., those that in an increasing scale of intolerance from 1 to 5 answer 1 or 2) is also 70%, which is remarkably close to the estimated value of  $\bar{x}$ .

In the following we present alternative specifications to those presented in Table 1 that allow us to assess the robustness of the results.

## 5.1 Variations: Religious Affiliation

Table 2 presents similar regressions as Table 1 but this time a dummy for religious affiliation has been used in place of religious intensity. Columns 1-5 in Table 2 use current religious affiliation ( $REL_{AFF}$ ) while columns 6-10 use a dummy that is equal to 1 if the respondent has ever been religious ( $REL_{EVER}$ ). The results are similar to those in Table 1. Columns 1 and 6 show that religious affiliation

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
REL <sub>AFF</sub>	-0.008 (0.201)	0.041** (0.031)	0.045** (0.019)	0.043** (0.022)	0.050*** (0.009)					
REL <sub>AFF</sub> × LIB <sub>50</sub>		-0.097** (0.022)	-0.099** (0.018)	-0.096** (0.022)	-0.118*** (0.009)					
RE <sub>LEVER</sub>						-0.008 (0.182)	0.034** (0.039)	0.038** (0.024)	0.037** (0.028)	0.041** (0.021)
RE <sub>LEVER</sub> × LIB <sub>50</sub>							-0.081** (0.029)	-0.084** (0.022)	-0.081** (0.028)	-0.096** (0.016)
LIB <sub>50</sub>	0.043 (0.548)	0.094 (0.207)	0.098 (0.191)	0.107 (0.143)	0.188*** (0.010)	0.046 (0.519)	0.101 (0.188)	0.105 (0.173)	0.115 (0.128)	0.195*** (0.009)
AGE	0.005** (0.014)	0.005*** (0.009)	0.006*** (0.001)	0.007*** (0.001)	0.005** (0.011)	0.005** (0.013)	0.005** (0.010)	0.006*** (0.001)	0.007*** (0.001)	0.005** (0.014)
AGE <sup>2</sup>	-0.000** (0.012)	-0.000*** (0.007)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.005)	-0.000*** (0.012)	-0.000*** (0.009)	-0.000*** (0.001)	-0.000*** (0.000)	-0.000*** (0.007)
GENDER	-0.169*** (0.000)	-0.169*** (0.000)	-0.169*** (0.000)	-0.168*** (0.000)	-0.190*** (0.000)	-0.170*** (0.000)	-0.170*** (0.000)	-0.169*** (0.000)	-0.169*** (0.000)	-0.190*** (0.000)
COHAB			-0.006 (0.291)	-0.006 (0.327)				-0.006 (0.303)	-0.005 (0.331)	
CHILDREN			-0.007 (0.311)	-0.007 (0.311)	-0.011 (0.214)			-0.007 (0.311)	-0.007 (0.312)	-0.011 (0.218)
HHSIZE			-0.011*** (0.002)	-0.011*** (0.001)	-0.010*** (0.004)			-0.011*** (0.002)	-0.011*** (0.001)	-0.010*** (0.005)
EDUYRS				-0.001 (0.323)	-0.001 (0.571)				-0.001 (0.329)	-0.001 (0.585)
HEALTH				-0.007** (0.018)	-0.005* (0.078)				-0.007** (0.017)	-0.005* (0.080)
EDU-PTNR					-0.004** (0.018)					-0.004** (0.017)
c	3.535*** (0.000)	3.504*** (0.000)	3.528*** (0.000)	3.620*** (0.000)	3.632*** (0.000)	3.609*** (0.000)	3.574*** (0.000)	3.594*** (0.000)	3.543*** (0.000)	3.553*** (0.000)
R <sup>2</sup>	0.109	0.110	0.112	0.112	0.134	0.110	0.110	0.112	0.112	0.135
Obs	142552	142552	141793	140897	95187	142697	142697	141934	141035	95274

Table 2: HOURS WORKED, RELIGIOUS AFFILIATION AND LIBERTIES, OLS

Notes. Dependent variable is HOURSWORKED. All models have been estimated by OLS and contain country and survey dummies. There are 34 countries. Robust standard errors clustered at the country level have been computed. p-values are in parentheses.

is not significantly associated with effort when the interaction between affiliation and liberties is not included in the regression. Once both affiliation and its interaction with liberties are included, the remaining columns show that the interaction term has the expected negative (and significant) sign. Also, the coefficient of religious affiliation is positive and significant in those regressions.<sup>19</sup> The coefficient of LIB<sub>50</sub> is positive in all columns but non-significant except when only people that cohabit are considered (columns 5 and 10).

## 5.2 Variations: Alternative dependent variables

Table 3 presents results using alternative ways of measuring effort. Columns 1 and 2 in Table 3 have as dependent variable the log of the desired number of hours worked (DESIREDHOURS). This measure has an important advantage over HOURSWORKED as it is not affected by personal or labor-market constraints. As a drawback, however, it can only be found in two of the six waves of the

<sup>19</sup>The marginal effect of religious affiliation on effort as a function of liberties is very similar to that displayed in Figure 4 and therefore we don't include it in the main text.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
REL <sub>INT</sub>	0.203 (0.185)		0.271** (0.030)		0.246** (0.010)	0.203 (0.151)	0.017 (0.677)	0.158* (0.053)
REL <sub>INT</sub> × LIB <sub>50</sub>	-0.629** (0.046)		-0.663** (0.014)		-0.719*** (0.001)	-0.783*** (0.008)	-0.060 (0.405)	-0.349** (0.018)
REL <sub>EVER</sub>		0.056** (0.030)		0.047*** (0.006)				
REL <sub>EVER</sub> × LIB <sub>50</sub>		-0.143*** (0.008)		-0.105*** (0.005)				
LIB <sub>50</sub>	0.543*** (0.000)	0.438*** (0.000)	0.355*** (0.002)	0.205** (0.011)	0.433** (0.010)	0.808*** (0.000)	0.153** (0.047)	0.268*** (0.000)
AGE	0.008*** (0.001)	0.008*** (0.004)	0.007*** (0.000)	0.007*** (0.002)	0.001 (0.772)	0.008*** (0.002)	0.010*** (0.000)	0.008*** (0.004)
AGE <sup>2</sup>	-0.000*** (0.000)	-0.000*** (0.001)	-0.000*** (0.000)	-0.000*** (0.001)	-0.000 (0.643)	-0.000*** (0.001)	-0.000*** (0.000)	-0.000*** (0.000)
GENDER	-0.228*** (0.000)	-0.235*** (0.000)	-0.222*** (0.000)	-0.225*** (0.000)				
CHILDREN	-0.041*** (0.000)	-0.039*** (0.000)	-0.018*** (0.007)	-0.013* (0.075)	-0.034** (0.019)	-0.071*** (0.000)	0.008* (0.090)	-0.003 (0.728)
EDUVRS	0.001 (0.251)	0.001 (0.416)	0.004** (0.012)	0.003* (0.071)	0.002 (0.306)	0.004** (0.039)	-0.004*** (0.000)	-0.004*** (0.000)
HHSIZE	-0.006* (0.054)	-0.008** (0.020)	-0.007** (0.036)	-0.010*** (0.009)	-0.018*** (0.001)	-0.015*** (0.005)	0.003 (0.106)	0.001 (0.649)
HEALTH	-0.010*** (0.003)	-0.007* (0.068)	-0.003 (0.523)	-0.003 (0.494)	-0.007 (0.129)	-0.011* (0.068)	-0.007*** (0.000)	-0.012*** (0.000)
EDU-PTNR	-0.008*** (0.000)	-0.008*** (0.000)	-0.001 (0.440)	-0.002 (0.239)	0.001 (0.549)	-0.005** (0.026)	-0.001 (0.337)	-0.004*** (0.007)
c	3.447*** (0.000)	3.341*** (0.000)	3.575*** (0.000)	3.548*** (0.000)	3.594*** (0.000)	3.194*** (0.000)	3.505*** (0.000)	3.487*** (0.000)
R <sup>2</sup>	0.208	0.200	0.125	0.123	0.154	0.233	0.041	0.076
Obs	29716	31127	89420	95298	46998	15813	42256	13903

Table 3: EFFORT, RELIGIOSITY AND LIBERTIES: ALTERNATIVE DEPENDENT VARIABLES AND DISAGGREGATE RESULTS FOR MEN AND WOMEN.

*Notes.* Dependent variable is DESIREDHOURS in columns 1, 2, 6 and 8, TOTALHOURS in columns 3, 4 and HOURSWORKED in columns 5 and 7. Columns 5 and 6 restrict the sample to women while columns 7 and 8 consider only men. All models contain country and survey dummies. Estimation has been carried out by 2SLS except for columns 1 and 3. There are 34 countries. Robust standard errors clustered at the country level have been computed. p-values are in parentheses.

ESS so the sample is considerably smaller. Column 1 uses religious intensity (REL<sub>INT</sub>) as a measure of religiosity and is estimated using 2SLS while column 2 presents results using religious affiliation (REL<sub>EVER</sub>) estimated by OLS. The specification is similar to that in column 10 in Table 1. Results remain as before: the effect of the interaction of religiosity and liberties is negative and significant and the effect of liberties is positive and significant. Columns 3 and 4 replicate columns 1 and 2 using TOTALHOURS as dependent variable. TOTALHOURS is similar to HOURSWORKED but it includes overtime work. Similar results are also obtained.

### 5.3 Variations: women versus men

The second half of Table 3 (columns 5 to 8) presents results disaggregated by sex. We do so as many religions have different prescribed behaviour to men and women, typically restricting women rights and liberties. Columns 5 and 6 restrict the sample to women while columns 7 and 8 do the same for men. The dependent variables are HOURSWORKED in columns 5 and 7 and DESIREDHOURS in

columns 6 and 8. Religiosity is measured using  $REL_{INT}$  and the estimation has been carried out using 2SLS. The results obtained when only women are considered are qualitatively very similar as those obtained for the whole population. Quantitatively, the effect is stronger.<sup>20</sup> Comparing the coefficients of religiosity and its interaction with liberties obtained for  $HOURSWORKED$  and  $DESIREDHOURS$  (columns 5 and 6, respectively), one can see that they are almost identical. Interestingly, the coefficient for the liberties variable is almost twice as large when  $DESIREDHOURS$  is employed. This suggests that liberties are a strong incentive for secular women and also that they don't manage to implement their desired choices as the availability of liberties makes them wish to work more. The picture differs when only men are considered. Column 7 shows that when the sample is restricted to men neither the coefficient of religiosity nor that of the interaction of liberties and religiosity are significant. However, when the dependent variable is  $DESIREDHOURS$ , a similar pattern as when the whole sample is considered is found again: the coefficient of religiosity is positive and significant and that of the interaction between religiosity and liberties is negative and significant. These results imply that when  $LIB_{50}$  is high, religious men would like to work less than secular. The contrast between the results in columns 7 and 8 highlights the well-known fact that men's labor supply is very inelastic. The coefficient of the liberties variable is also considerably larger when desired rather than actual hours worked is used as dependent variable, which corroborates the important role of liberties as a work incentive for seculars.

#### 5.4 Variations: Robustness of the IV estimation

Despite its popularity 2SLS is known to perform poorly in several situations, especially when instruments are weakly correlated with the endogenous variables. For the sake of robustness, we have reestimated our baseline specification (column 10 in Table 1) using two alternative methods: limited information maximum likelihood (LIML) and Fuller methods, see columns 1 and 2 in Table 4, respectively.<sup>21</sup> Results are virtually identical, showing that weak instruments is not a problem in our case.

Columns 3 and 4 in Table 4 present further robustness checks to the IV estimation strategy.

<sup>20</sup>Focusing on column 5 in Table 3, an increase of one standard deviation in the intensity of religious beliefs of women is associated with a decrease in the number of hours worked of 2% (0.73 hours on average), 4.8% (1.66 hours on average) and 7.5% (2.60 hours on average) for  $LIB_{50}$  in the 50th, 75th and 95th percentile, respectively.

<sup>21</sup>The value of the parameter  $\alpha$  needed in the implementation of Fuller's method is set equal to 1.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
REL <sub>INT</sub>	0.178 (0.103)	0.178 (0.103)	0.265* (0.066)	0.221* (0.090)	0.168 (0.119)	0.250* (0.079)	0.118 (0.165)	0.409 (0.114)
REL <sub>INT</sub> × LIB <sub>50</sub>	-0.445* (0.054)	-0.445* (0.054)	-0.656** (0.032)	-0.515* (0.064)			-0.340*** (0.007)	-0.683* (0.054)
REL <sub>INT</sub> × LIB <sub>40</sub>					-0.473* (0.053)			
REL <sub>INT</sub> × LIB <sub>60</sub>						-0.615** (0.038)		
REL <sub>INT</sub> × AGE							0.000 (0.824)	-0.003 (0.180)
LIB <sub>50</sub>	0.219** (0.044)	0.219** (0.044)	0.377*** (0.003)	0.314*** (0.007)			0.246*** (0.005)	0.383*** (0.009)
LIB <sub>40</sub>					0.270*** (0.003)			
LIB <sub>60</sub>						0.309*** (0.010)		
AGE <sup>2</sup>	-0.000*** (0.000)	-0.000*** (0.000)	-0.000** (0.028)	-0.000** (0.031)	-0.000*** (0.003)	-0.000*** (0.002)	-0.000*** (0.004)	-0.000** (0.012)
AGE	0.007*** (0.000)	0.007*** (0.000)	0.004* (0.059)	0.004** (0.046)	0.005*** (0.008)	0.005*** (0.009)	0.005*** (0.007)	0.005*** (0.007)
GENDER	-0.165*** (0.000)	-0.165*** (0.000)	-0.203*** (0.000)	-0.180*** (0.000)	-0.186*** (0.000)	-0.186*** (0.000)	-0.187*** (0.000)	-0.186*** (0.000)
COHAB	-0.004 (0.472)	-0.004 (0.472)						
CHILDREN	-0.009 (0.186)	-0.009 (0.186)	-0.018* (0.054)	-0.015 (0.103)	-0.015* (0.083)	-0.014* (0.090)	-0.011 (0.197)	-0.014 (0.100)
EDUYRS	-0.000 (0.756)	-0.000 (0.756)	0.000 (0.865)	-0.001 (0.629)	0.000 (0.950)	0.000 (0.908)	-0.001 (0.640)	0.000 (0.954)
HHSIZE	-0.010*** (0.002)	-0.010*** (0.002)	-0.008** (0.035)	-0.005 (0.120)	-0.008** (0.020)	-0.008** (0.018)	-0.009*** (0.007)	-0.008** (0.016)
HEALTH	-0.007** (0.018)	-0.007** (0.018)	-0.004 (0.263)	-0.005 (0.177)	-0.005 (0.101)	-0.005 (0.107)	-0.006* (0.066)	-0.005* (0.097)
EDU-PTNR			-0.004** (0.012)	-0.002 (0.156)	-0.003** (0.033)	-0.003** (0.044)	-0.004** (0.019)	-0.003** (0.040)
c	3.613*** (0.000)	3.613*** (0.000)	3.602*** (0.000)	3.592*** (0.000)	3.627*** (0.000)	3.594*** (0.000)	3.605*** (0.000)	3.527*** (0.000)
R <sup>2</sup>	0.115	0.115	0.141	0.127	0.138	0.138	0.135	0.137
Obs	132173	132173	77441	68392	89254	89254	96448	89254

**Table 4: EFFORT, RELIGIOSITY AND LIBERTIES: IV ESTIMATION AND ALTERNATIVE MEASURES OF LIBERTIES**

*Notes.* Dependent variable is HOURSWORKED. Columns 1 and 2 have been estimated by LIML and Fuller methods, columns 3 to 6 and 8 by 2SLS and column 7 by OLS. Column 3 drops from the sample the least religious countries while column 4 excludes individuals from non-dominant religions. Columns 5 and 6 consider alternative definitions of individual liberties. See the main text for more detailed explanations. Columns 7 and 8 include the interaction of religiosity and age. All models contain country and survey dummies. Robust standard errors clustered at the country level have been computed. p-values are in parentheses.

Column 3 drops the least religious countries from the sample (those with a share of religious individuals smaller than 50%).<sup>22</sup> Since these societies are nowadays eminently secular, individuals that have remained religious through the secularisation process might differ significantly from non-religious individuals for reasons other than their religiosity. Column 4 excludes from the sample religious individuals whose religious denomination is not the dominant in the country. By doing this, we want to exclude minority groups (like muslims in most European countries) whose (unobserved) individual characteristics and access to the job market can differ substantially from individuals belonging to the dominant religion for reasons other than their religiosity. Results remain

<sup>22</sup>These countries are Sweden, Latvia, Estonia and Czech Republic.

robust to these variations.

Finally, as in any IV analysis, we cannot entirely exclude the possibility that our instruments violate the exclusion restriction. To examine the robustness of our IV estimates to violation of this hypothesis, we use the method proposed by Conley, Hansen and Rossi (2012). In this way, we can examine the consequences of a possible direct effect on our instruments on individual effort. Appendix B summarizes this analysis. It shows that our results are very robust to violations of the exclusion restriction.

## 5.5 Variations: alternative measures of liberties

Columns 5 and 6 in Table 4 reestimate our baseline specification using alternative measures of individual liberties:  $LIB_{40}$  and  $LIB_{60}$ . Our conclusions remain robust to using these measures. An additional concern is that the liberties variables are very correlated with age as older people have been exposed to less liberties throughout their lifetime. Thus, those measures can be capturing some age effects rather than the effect of liberties. Columns 7 and 8 add to the baseline specification the interaction of religiosity and age. Column 7 has been estimated by OLS while column 8 by 2SLS. The coefficient of the interaction of age and religiosity is very small and not significantly different from zero and, otherwise, results remain similar as before.

## 6 Discussion of the model's assumptions

Our theory argues that religiosity directly affects individual preferences through the valuation of civil liberties only. Then, due to the complementarity between liberties and consumption (that is higher than that of leisure and liberties), religiosity also has an influence on the choice of effort: everything else equal optimal effort is smaller among religious than among seculars.

We have provided empirical support for the result that religiosity interacted with liberties has a significant and sizeable negative effect on labor supply. But, this empirical result could have been caused by channels that might be different from ours.

This section discusses this issue. On this respect we do two things: First we explore whether there is independent evidence supporting each of the steps in our chain of reasoning: (a) do religious people tend to be more conservative than secular in their appreciation for civil liberties? (b)

is there a complementarity between consumption and liberties so that religious people value less an increase in consumption than their secular counterparts, especially when liberties are high? and (c) is there a similar complementarity between liberties and leisure?

Second we discuss potential alternative channels yielding the same empirical result.

## **6.1 Do religious people dislike liberties?**

At the core of our analysis is the assumption that religious people dislike civil liberties, not only their own use but also because of the externality that such level of liberties generates for them. There is empirical evidence supporting this conjecture (see for instance Guiso et al. 2003 and Inglehart and Norris, 2003). We shall show that these results are corroborated in our sample. The ESS contain a few questions that allow us to examine this conjecture. We consider variables related to attitudes towards divorce (DIVORCE) and towards the role of women in the job market: WOMEN-DROPJOB and WOMEN-LESSRIGHT. The two latter variables reflect beliefs about whether women should be prepared to cut down on paid work for the sake of family and about whether men should have more right to jobs when jobs are scarce, respectively. We have also included intolerance towards gay rights, GAYRIGHTS. All variables have been normalised so that higher values (in a scale from 1 to 5) reveal a higher degree of intolerance, see Appendix A for exact definitions of these variables.

Table 5 reports the output of regressing each of these variables on a measure of religiosity (either affiliation or intensity), a list of standard individual controls (the same ones we use in our main specifications), and country and survey fixed effects. The results show that both religious affiliation and religious intensity are strongly associated with more intolerant attitudes towards gay rights (column 1-2), divorce (columns 3-4) and women's role in the job market (columns 5-8). We can therefore infer that religion shapes preferences towards liberties.

## **6.2 Do religiosity and liberties jointly affect the valuation of consumption and leisure?**

Proposition 1 focuses on the case in which there is larger complementarity between liberties and consumption than between liberties and leisure. Under this condition we derive that an increase in religiosity reduces incentives to work. We now provide evidence that this is indeed the relevant case.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
REL <sub>INT</sub>	1.391*** (0.000)		0.986*** (0.000)		0.963*** (0.000)		0.761*** (0.000)	
REL <sub>EVER</sub>		0.330*** (0.000)		0.194*** (0.000)		0.249*** (0.000)		0.148*** (0.000)
LIB <sub>50</sub>	0.023 (0.949)	-0.271 (0.506)	-0.056 (0.913)	-0.162 (0.761)	-0.556 (0.289)	-0.729 (0.210)	-0.459 (0.465)	-0.587 (0.369)
AGE	-0.014*** (0.004)	-0.016*** (0.003)	-0.050*** (0.000)	-0.051*** (0.000)	-0.036*** (0.000)	-0.039*** (0.000)	-0.037*** (0.000)	-0.037*** (0.000)
AGE <sup>2</sup>	0.000*** (0.000)	0.000*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
GENDER	-0.511*** (0.000)	-0.393*** (0.000)	-0.731*** (0.000)	-0.637*** (0.000)	-0.200*** (0.000)	-0.121*** (0.002)	-0.567*** (0.000)	-0.491*** (0.000)
COHAB	-0.024 (0.131)	-0.024 (0.148)	-0.263*** (0.000)	-0.271*** (0.000)	-0.094*** (0.000)	-0.097*** (0.000)	-0.161*** (0.000)	-0.163*** (0.000)
CHILDREN	-0.019 (0.430)	-0.022 (0.392)	-0.158*** (0.000)	-0.161*** (0.000)	0.020 (0.392)	0.023 (0.304)	-0.108*** (0.002)	-0.113*** (0.002)
EDUYRS	-0.065*** (0.000)	-0.067*** (0.000)	-0.039*** (0.000)	-0.040*** (0.000)	-0.063*** (0.000)	-0.065*** (0.000)	-0.123*** (0.000)	-0.122*** (0.000)
HHSIZE	0.060*** (0.000)	0.082*** (0.000)	0.103*** (0.000)	0.111*** (0.000)	0.053*** (0.000)	0.065*** (0.000)	0.068*** (0.000)	0.079*** (0.000)
HEALTH	0.077*** (0.000)	0.080*** (0.000)	0.021 (0.290)	0.023 (0.283)	0.027 (0.159)	0.028 (0.151)	0.092*** (0.000)	0.090*** (0.000)
Pseudo R <sup>2</sup>	0.099	0.092	0.076	0.072	0.066	0.062	0.098	0.094
Obs	157109	155350	26706	25404	55081	53673	27036	25726

Table 5: RELIGIOSITY AND LIBERTIES

Notes. Dependent variables are GAYRIGHTS (columns 1-2), DIVORCE (columns 3-4), WOMEN-DROPJOB (column 5-6) and WOMEN-LESSRIGHT (column 7-8). All models contain country and survey dummies and have been estimated by maximum likelihood in an ordinal logit specification. There are 34 countries. Robust standard errors clustered at the country level have been computed. p-values are in parentheses.

The ESS contain a question that explicitly addresses how individuals value an increase of consumption and wealth (VALUE-CONSUMP). More specifically, (VALUE-CONSUMP) measures the importance of being rich, having money and expensive goods. It takes 6 values, ranging from not at all important to very important. Table 6 explores whether there is a joint effect of religiosity and liberties on VALUE-CONSUMP. All columns are estimated by maximum likelihood in an ordinal logit specification with the exception of column 5 that has been estimated by OLS. Column 1 regresses VALUE-CONSUMP on religious intensity, REL<sub>INT</sub>, a measure of liberties (LIB<sub>50</sub>), a list of individual controls similar to the one employed in Section 5 and country and survey fixed effects. The sign of REL<sub>INT</sub> is negative, confirming the common wisdom that religious people value less material wealth. Column 2 introduces the interaction of religious beliefs and liberties. We are primarily interested in the sign of this interaction that we postulate to be negative. Column 2 shows that the coefficient of the interaction is negative and significant (p-value .064). Columns 3 and 4 use alternative definitions of liberties (LIB<sub>40</sub> and LIB<sub>60</sub>, respectively) and a similar result is found. Column 5 reestimates column 2 using a linear specification, rather than an ordinal logit one, in order to facilitate the interpretation of the interacted terms. The product of religiosity and liberties

	[1]	[2]	[3]	[4]	[5]	[6]
REL <sub>INT</sub>	-0.222*** (0.000)	-0.026 (0.842)	-0.027 (0.815)	-0.013 (0.928)	-0.028 (0.750)	
REL <sub>EVER</sub>						0.205** (0.016)
REL <sub>INT</sub> × LIB <sub>50</sub>		-0.428* (0.064)			-0.261* (0.097)	
REL <sub>INT</sub> × LIB <sub>40</sub>			-0.444** (0.035)			
REL <sub>INT</sub> × LIB <sub>60</sub>				-0.447* (0.071)		
REL <sub>EVER</sub> × LIB <sub>50</sub>						-0.345*** (0.010)
LIB <sub>50</sub>	-0.292 (0.419)	-0.140 (0.670)			-0.121 (0.615)	0.012 (0.968)
LIB <sub>40</sub>			-0.152 (0.558)			
LIB <sub>60</sub>				-0.150 (0.688)		
AGE <sup>2</sup>	0.000** (0.012)	0.000** (0.022)	0.000** (0.017)	0.000** (0.018)	0.000*** (0.003)	0.000** (0.032)
AGE	-0.037*** (0.000)	-0.036*** (0.000)	-0.037*** (0.000)	-0.037*** (0.000)	-0.028*** (0.000)	-0.036*** (0.000)
GENDER	-0.442*** (0.000)	-0.442*** (0.000)	-0.442*** (0.000)	-0.442*** (0.000)	-0.295*** (0.000)	-0.462*** (0.000)
CHILDREN	-0.039** (0.050)	-0.041** (0.038)	-0.040* (0.054)	-0.042** (0.025)	-0.027** (0.038)	-0.040** (0.041)
EDUYRS	0.003 (0.574)	0.003 (0.513)	0.003 (0.491)	0.003 (0.522)	-0.000 (0.983)	0.003 (0.537)
HHSIZE	-0.020** (0.023)	-0.020** (0.023)	-0.020** (0.023)	-0.020** (0.023)	-0.014** (0.016)	-0.024** (0.006)
HEALTH	-0.087*** (0.000)	-0.088*** (0.000)	-0.088*** (0.000)	-0.088*** (0.000)	-0.059*** (0.000)	-0.090*** (0.000)
COHAB	-0.068*** (0.000)	-0.068*** (0.000)	-0.068*** (0.000)	-0.069*** (0.000)	-0.036*** (0.003)	-0.065*** (0.000)
(Pseudo) $R^2$	0.051	0.051	0.051	0.051	0.051	0.051
Obs	156704	156704	156704	156704	156704	154888

Table 6: VALUATION OF CONSUMPTION

Notes. Dependent variable is VALUE-CONSUMP. All models contain country and survey dummies and have been estimated by maximum likelihood in an ordinal logit specification, except column 5 that has been estimated by OLS. There are 33 countries. Robust standard errors clustered at the country level have been computed. p-values are in parentheses.

has a negative and significant coefficient at the 10% significance level also in this case. Finally, column 6 replicates once more column 2 considering this time religious affiliation ( $REL_{EVER}$ ) instead of religious intensity and similar results are also obtained. In sum, results in Table 6 indicate that the interaction of religiosity and liberties has a significant effect on the valuation of consumption.

To complete our argument we need to show that the effect of such interacted term on the valuation of leisure is smaller than the effect on the valuation of consumption (see Proposition 1). To this effect we also run similar regressions as those presented in Table 6 using a proxy for the valuation of leisure as dependent variable. VALUE-LEISURE reflects the importance of having a good time, measured on a 1 to 6 scale where 6 reflects maximum valuation. Table 7 is identical to Table 6 except that the dependent variable is VALUE-LEISURE. Column 1 shows that religious intensity is negatively associated with VALUE-LEISURE. In contrast to Table 6, columns 2 to 6 show that the interaction between religiosity and liberties is not significantly different from zero. These results

	[1]	[2]	[3]	[4]	[5]	[6]
REL <sub>INT</sub>	-0.375*** (0.000)	-0.474** (0.019)	-0.444** (0.013)	-0.492** (0.024)	-0.306** (0.032)	
REL <sub>EVER</sub>						-0.195** (0.036)
REL <sub>INT</sub> × LIB <sub>50</sub>		0.214 (0.554)			0.125 (0.613)	
REL <sub>INT</sub> × LIB <sub>40</sub>			0.155 (0.632)			
REL <sub>INT</sub> × LIB <sub>60</sub>				0.246 (0.524)		
REL <sub>EVER</sub> × LIB <sub>50</sub>						0.171 (0.269)
LIB <sub>50</sub>	-0.126 (0.762)	-0.202 (0.630)			-0.081 (0.785)	-0.167 (0.693)
LIB <sub>40</sub>			-0.182 (0.589)			
LIB <sub>60</sub>				-0.332 (0.460)		
AGE	-0.040*** (0.000)	-0.040*** (0.000)	-0.040*** (0.000)	-0.040*** (0.000)	-0.025*** (0.000)	-0.039*** (0.000)
AGE <sup>2</sup>	0.000** (0.027)	0.000** (0.016)	0.000** (0.014)	0.000** (0.015)	0.000** (0.044)	0.000** (0.045)
GENDER	-0.114*** (0.002)	-0.114*** (0.002)	-0.114*** (0.002)	-0.114*** (0.002)	-0.077*** (0.004)	-0.146*** (0.000)
CHILDREN	-0.135*** (0.000)	-0.134*** (0.000)	-0.133*** (0.000)	-0.135*** (0.000)	-0.084*** (0.000)	-0.134*** (0.000)
EDUYRS	0.015*** (0.005)	0.015*** (0.007)	0.015*** (0.007)	0.015*** (0.006)	0.012*** (0.003)	0.016*** (0.004)
HHSIZE	-0.055*** (0.000)	-0.056*** (0.000)	-0.056*** (0.000)	-0.055*** (0.000)	-0.040*** (0.000)	-0.061*** (0.000)
HEALTH	-0.171*** (0.000)	-0.171*** (0.000)	-0.171*** (0.000)	-0.171*** (0.000)	-0.116*** (0.000)	-0.172*** (0.000)
COHAB	0.047*** (0.005)	0.047*** (0.005)	0.047*** (0.005)	0.047*** (0.005)	0.023** (0.045)	0.048*** (0.004)
(Pseudo) R <sup>2</sup>	0.047	0.047	0.047	0.047		0.046
Obs	155910	155910	155910	155910	155910	154279

Table 7: VALUATION OF LEISURE

Notes. Dependent variable is VALUE-LEISURE. All models contain country and survey dummies and have been estimated by maximum likelihood in an ordinal logit specification except for column 5 that has been estimated by OLS. There are 33 countries. Robust standard errors clustered at the country level have been computed. p-values are in parentheses.

suggest that the data don't support the existence of a complementarity between leisure and the interaction religiosity/liberties, in line with our assumptions in Proposition 1.

### 6.3 Other potential channels

Our paper develops a model that generates the prediction that labor supply depends on the interaction of religiosity with the level of civil liberties yielding a negative effect of religiosity on effort. Furthermore, this negative relationship is steeper the wider the liberties afforded. The empirical results obtained in the sections above confirm these results, as well as every individual step in our chain of reasoning: We have shown that religiosity is associated with less tolerant attitudes towards civil liberties; that the marginal utility of consumption is negatively related to religiosity/liberties and that the marginal valuation of leisure does not depend on this interaction.

Still, one could argue that the relationship between religiosity and effort could have been

generated through channels different from the one in our model. We now discuss some alternative channels, all conceptually related to our approach and not contradicted by our empirical results.

First, we could interpret legal caps as setting a direct constraint on choices. Our model does this, with the implication that for the secular this constraint will be effectively binding their choice of use of liberties. But we could go one step further and argue that some of these liberties impose constraints directly on the choice of labor supply, rather than a more abstract constraint on the use of liberties. The implication would be that the secular would be the ones for whom the choice of effort would most effectively be constrained. However, this would leave unexplained why religious individuals are so militantly against the lifting of these constraints. To explain this fact we need personal happiness to depend on the externality effect of the legal cap on liberties.

We have obtained that our results for women are stronger than for men. Modelling liberties as a constraint may be a simple way to interpret this result. In fact, most of the liberties we consider in our index pertain to women. It could have been the case that once such constraints were lifted in many countries, secular women could have worked more while religious women would still feel culturally constrained, creating the large effect for women. While this is a possibility which we do not rule out, we feel that this kind of problem needs to be resolved in a more elaborate model taking into consideration the family allocation of effort. In any case, evidence shows that while women with high skilled partners have increased their labor effort in Europe along with the increase in liberties, their partners did so as well, where the opposite is true for women with low skilled partners.<sup>23</sup> This implies that the widening of liberties is not a mere lifting of the labor market participation constraint to women because we should be observing some degree of substitution in the labor supply within the family. These more complicated considerations on family allocation of labor supply are left for future research.

## 7 Concluding remarks

We have shown, theoretically and empirically, that religious negative views on liberties reduce labor effort and that this effect is stronger the higher is the legal cap on liberties. This negative relationship between individual effort and the interaction of religiosity with liberties is novel and

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<sup>23</sup>See Faggio and Nickel (2007).

robust. The model also delivers the prediction that the marginal utility of consumption is decreasing with the degree of religiosity, interacted with liberties.

Our model has a number of interesting implications for research. In the first place, at the aggregate level, our model implies that per capita income is positively related to secularism. This is in line with the findings of Barro and McCleary (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.<sup>24</sup> But, in addition, our model also predicts that the availability of civil liberties will increase inequality (as seculars have more incentives to work but religious don't). Testing these aggregate predictions on aggregate output and income inequality is in our research agenda.

A second set of associated questions is examined in Esteban, Levy and Mayoral (2015) where we study the role of religiosity in the political choices over redistribution and individual or civil liberties. We show how these are intertwined, and that religious views against civil liberties can lead to both repression of liberties and low levels of redistribution in society.

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<sup>24</sup>This negative relationship also arises in other models of religion as for example in Iannaccone (1992) or Levy and Razin (2012) where religious agents devote time to non-productive religious activity such as rituals. Benabou et al (2013) show a negative relationship between religiosity and output or growth through the negative religious attitudes on scientific innovations and technological progress.

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# A Appendix

## A.1 Variable definition

This section presents detailed definitions for the variables employed in the empirical analysis.

REL<sub>AFF</sub>: Dummy variable based on the question: *Do you consider yourself as belonging to any particular religion or denomination?*

REL<sub>EVER</sub>: Dummy variable based on the question: *Have you ever considered yourself as belonging to any particular religion or denomination, either currently or in the past?*

REL<sub>INT</sub>: 0-1 index computed as the simple average of RELIGIOSITY, PRAY and ATTENDANCE.

RELIGIOSITY: *Regardless of whether you belong to a particular religion, how religious would you say you are?.* Answers range from “not at all religious” (0) to “very religious” (10). The index has been renormalised to be between 0 and 1.

PRAY: *Apart from when you are at religious services, how often, if at all, do you pray?* Answers range from never (1) to everyday (7). The index has been renormalised to be between 0 and 1.

ATTENDANCE: *Apart from special occasions such as weddings and funerals, about how often do you attend religious services nowadays?* Answers range from never (1) to everyday (7). The index has been renormalised to be between 0 and 1.

REL<sub>INT</sub><sup>IV</sup>: Instrument for REL<sub>INT</sub>, see Section 4.3 for a description of how it has been computed.

HOURSWORKED: Log of hours worked, obtained from the question *What are/were your total “basic” or contracted hours each week (in your main job), excluding any paid and unpaid overtime?*

TOTALHOURS: Log of hours worked, obtained from the question *Regardless of your basic or contracted hours, how many hours do/did you normally work a week (in your main job), including any paid or unpaid overtime?*

DESIREDHOURS: Log of desired hours worked, based on the question *How many hours a week, if any, would you choose to work, bearing in mind that your earnings would go up or down according to how many hours you work?*

LIB<sub>G</sub>: Individual-specific liberties variable, computed as the average of the (country-level) liberties index corresponding to the years when the individual was between 18 and G years of age, with  $G = \{40, 50 \text{ and } 60\}$ . See Section A.2 for details on the construction of the liberties index.

AGE: Age of respondent, calculated from year of birth.

COHAB: Dummy variable equal to 1 if respondent lives with husband/wife/partner.

CHILDREN: Dummy variable if respondent lives with children.

EDUYRS: Years of full-time education completed.

EDU-PTNR: Highest level of education successfully completed of husband/wife/partner.

HHSIZE: Number of people living regularly as member of household

HEALTH: Subjective measure of own's health ranging from 1 (very good) to 5 (very bad).

VALUE-CONSUMPTION. *It is important to be rich, have a lot of money and expensive things.*

Answers range from 1 (not at all important) to 6 (very important).

VALUE-LEISURE. *It is important to have a good time.* Answers range from 1 (not at all important) to 6 (very important).

GAYRIGHTS: *Gay men and lesbians should be free to live their own life as they wish.* Answers range from 1 (strongly agree) to 5 (strongly disagree).

WOMEN-DROPJOB: *Women should be prepared to cut down on paid work for sake of family?* Answers range from 1 (strongly disagree) to 5 (strongly agree).

WOMEN-LESSRIGHT: *Men should have more right to job than women when jobs are scarce.* Answers range from 1 (strongly disagree) to 5 (strongly agree).

DIVORCE: *Children in home, parents should stay together even if don't get along.* Answers range from 1 (strongly disagree) to 5 (strongly agree).

## **A.2 Construction of the civil liberties index**

The civil liberties index reflects the evolution of the legislation on abortion, divorce, women's rights, LGBT rights, and Euthanasia from 1960 to 2013. To elaborate the index, we have first constructed individual indices for each of these categories as follows.

- Abortion index: We consider whether abortion is allowed in the following situations: 1) to save mother's life, 2) to preserve physical health, 3) to preserve mental health, 4) if pregnancy is due to rape or incest, 5) in case of fetal impairment, 6) for economic or social reasons and 7) on request. For each country and year, a value of 1 is assigned if abortion is allowed in each of the above mentioned scenarios and zero otherwise. The abortion index for that country/year is the average of the assigned quantities. Sources: UN Population Division.

Abortion Policies: A Global Review, Volume 3 (2002), data updated with information from national pages.

- LGBT rights index: We have coded whether the following items are legal: 1) same-sex sexual activities, 2) same-sex unions, 3) adoption by same-sex couples, and 4) same-sex marriage. For each country and year, a value of 1 is assigned to each of these categories in case it is legal and zero otherwise. The LGBT rights index is computed as the average of the resulting quantities. Sources: Wikipedia ([https://en.wikipedia.org/wiki/LGBT\\_rights\\_in\\_Europe](https://en.wikipedia.org/wiki/LGBT_rights_in_Europe)), Pew Research Center.
- Divorce index: For each country and year we've coded whether 1) divorce is legal, 2) no-fault divorce is legal (i.e. if divorce is allowed on grounds other than fault, such as mutual consent) and 3) unilateral divorce is legal. The divorce index is computed as the previous cases. Sources: Boele-Woelki et al. (2003, 2004 and 2005), Smith (2002), and Gonzalez and Viitanen (2009).
- Euthanasia index: a 1 is assigned to country/years where Euthanasia is legal. Sources: [www.euthanasia.com](http://www.euthanasia.com) and <http://www.wisegeek.com/which-countries-have-legalized-euthanasia.htm>.
- Women's rights index: The extent of gender parity has been captured through 17 different indicators related to property ownership, marital regimes, inheritance laws, status and capacity, access to judicial system and Constitutional rights. Data has been obtained from the the World Bank, 50 Years of Women's Legal Rights, <http://wbl.worldbank.org/data/timeseries>. See that webpage for more details on the categories included in the index.

To elaborate the civil liberties index, we have computed the simple average of the above-defined indicators for each country and year. We have also used principal components to aggregate the indices and the results were virtually identical.

### **A.3 Summary Statistics**

Tables A1 and A2 present summary statistics of the variables employed in the empirical analysis. Table A1 presents country-by-country averages of the key variables in our empirical analysis: effort,

country	HW	Des. HW	REL <sub>INT</sub>	REL <sub>EVER</sub>	REL <sub>AFF</sub>	LIB <sub>50</sub>	LIB <sub>40</sub>	LIB <sub>60</sub>
Austria	34.74	34.24	0.41	0.89	0.71	0.57	0.56	0.57
Belgium	34.80	34.61	0.27	0.56	0.38	0.65	0.61	0.66
Bulgaria	41.03	42.18	0.34	0.79	0.78	0.32	0.32	0.32
Croatia	41.40	39.74	0.53	0.84	0.79	0.29	0.28	0.30
Cyprus	39.09	36.06	0.59	0.99	0.99	0.36	0.33	0.37
Czech Republic	40.85	42.93	0.15	0.21	0.18	0.50	0.49	0.50
Denmark	35.69	35.29	0.26	0.65	0.58	0.60	0.58	0.61
Estonia	39.20	43.94	0.21	0.21	0.17	0.39	0.37	0.40
Finland	38.45	37.08	0.35	0.68	0.58	0.57	0.56	0.57
France	34.76	36.28	0.21	0.54	0.40	0.50	0.48	0.51
Germany	35.53	33.72	0.28	0.65	0.52	0.58	0.57	0.59
Greece	41.19	38.99	0.58	0.93	0.92	0.42	0.40	0.43
Hungary	39.69	44.41	0.30	0.61	0.54	0.58	0.57	0.58
Iceland	38.70	36.58	0.38	0.60	0.46	0.53	0.51	0.54
Ireland	36.27	32.63	0.55	0.91	0.81	0.20	0.18	0.22
Israel	38.35	36.86	0.43	0.95	0.94	0.30	0.29	0.31
Italy	38.97	.	0.51	0.81	0.76	0.41	0.40	0.42
Latvia	39.12	.	0.29	0.47	0.43	0.37	0.35	0.38
Lithuania	38.67	40.14	0.39	0.86	0.83	0.37	0.35	0.38
Luxembourg	37.24	34.21	0.31	0.85	0.74	0.49	0.47	0.50
Netherlands	31.16	30.13	0.32	0.59	0.38	0.55	0.51	0.57
Norway	35.51	36.44	0.26	0.61	0.51	0.64	0.61	0.65
Poland	41.57	48.36	0.60	0.95	0.91	0.23	0.23	0.23
Portugal	38.22	41.06	0.47	0.90	0.83	0.41	0.38	0.42
Romania	40.86	.	0.55	0.94	0.93	0.40	0.38	0.40
Russia	40.39	39.33	0.31	0.53	0.52	0.42	0.42	0.42
Slovakia	40.42	42.74	0.47	0.81	0.75	0.42	0.40	0.43
Slovenia	40.07	39.49	0.35	0.57	0.52	0.38	0.37	0.38
Spain	38.00	35.28	0.34	0.85	0.69	0.38	0.35	0.39
Sweden	37.72	35.91	0.21	0.35	0.27	0.75	0.73	0.75
Switzerland	36.14	33.21	0.40	0.81	0.64	0.39	0.39	0.40
Turkey	47.25	41.58	0.65	0.98	0.97	0.31	0.30	0.31
Ukraine	39.77	39.42	0.44	0.73	0.71	0.37	0.36	0.37
United Kingdom	33.67	31.81	0.26	0.53	0.39	0.62	0.60	0.63
Average	37.62	37.57	0.36	0.69	0.60	0.47	0.45	0.47
Std. Dev	37.62	37.57	0.36	0.69	0.60	0.47	0.45	0.47

Table A1: SUMMARY STATISTICS

*Notes.* This table presents country-by-country averages of the key variables of the empirical analysis: the number of hours worked (HW), the desired number of hours worked (Des. HW), religious intensity and affiliation (REL<sub>INT</sub>, REL<sub>EVER</sub> and REL<sub>AFF</sub>) and the liberties variables (LIB<sub>50</sub>, LIB<sub>40</sub> and LIB<sub>60</sub>). See Appendix A for definitions.

religiosity and the liberties. Table A2 presents more statistics related to all the variables considered in the empirical section.

## B Appendix: Relaxing instrument exogeneity

In this appendix we describe our implementation of the approach proposed by Conley, Hansen and Rossi (2012), which allows to examine the robustness of 2SLS estimates to violations of the exclusion restriction. Consider the following model

$$Y = X\beta + Z\gamma + \epsilon,$$

where X is a matrix of (endogenous) regressors and Z is a matrix of instruments (uncorrelated with

variable	Obs.	Mean	Std. Dev.	Min	Max
HOURSWORKED	145723	3.57	0.39	0.00	4.61
TOTALHOURS	145492	3.64	0.43	0.00	4.61
DESIREDHOURS	48498	3.56	0.40	0.00	5.01
REL <sub>INT</sub>	167583	0.36	0.27	0.00	1.00
REL <sub>AFF</sub>	165495	0.60	0.49	0.00	1.00
REL <sub>EVER</sub>	165699	0.69	0.46	0.00	1.00
REL <sub>INT</sub> <sup>IV</sup>	154357	0.36	0.16	0.00	0.94
LIB <sub>50</sub>	167818	0.47	0.16	0.00	1.00
LIB <sub>40</sub>	167818	0.45	0.17	0.00	1.00
LIB <sub>60</sub>	167818	0.47	0.16	0.00	1.00
AGE	165684	42.63	13.19	19.00	104.00
GENDER	167651	0.54	0.50	0.00	1.00
COHAB	166682	1.32	0.47	1.00	2.00
CHILDREN	167235	0.51	0.50	0.00	1.00
EDUYRS	166297	12.73	3.93	0.00	56.00
HHSIZE	167691	3.00	1.50	1.00	77.00
HEALTH	167651	2.07	0.83	1.00	9.00
EDU-PTNR:	112238	3.25	1.63	0.00	55.00
VALUE-LEISURE	160248	4.11	1.30	1.00	6.00
VALUE-CONSUMPTION	161072	3.06	1.34	1.00	6.00
GAYRIGHTS	161569	2.20	1.16	1.00	5.00
DIVORCE	27501	2.58	1.14	1.00	5.00
WOMEN-LESSRIGHT	56470	3.13	1.16	1.00	5.00
WOMEN-DROPJOB	27847	2.59	1.23	1.00	5.00

Table A2: SUMMARY STATISTICS

Notes. This table presents summary statistics for the variables considered in the empirical analysis, see Appendix A for definitions.

ε). The exclusion restriction is satisfied if  $\gamma = 0$ . Conley et al. consider violations of this assumption by allowing  $\gamma$  to follow a distribution F. Assuming that this distribution is given by  $F = N(\mu_\gamma, \Omega_\gamma)$ , it follows that

$$\hat{\beta} \sim N(\beta + A\mu_\gamma, \Omega_{2sls} + A\Omega_\gamma A'), \quad (6)$$

$$A = (X'Z(Z'Z)^{-1}Z'X)^{-1}(X'Z), \quad (7)$$

where  $N(\beta, \Omega_{2sls})$  is the usual 2SLS asymptotic distribution. Expression (6) is useful as it allows to compute valid confidence bands for  $\hat{\beta}$  when the exclusion restriction is violated. In the following, consider that X contains our potentially endogeneous regressors (i.e., REL<sub>INT</sub> and REL<sub>INT</sub> × LIB<sub>50</sub>) and Z the corresponding instruments (REL<sub>INT</sub><sup>IV</sup> and REL<sub>INT</sub><sup>IV</sup> × LIB<sub>50</sub>). Values of  $\gamma$  different from zero imply that the instruments have a direct effect on the dependent variable. We assume that  $\gamma$  follows a zero-mean bivariate Normal distribution with variance-covariance matrix

$$\Sigma_\gamma = \begin{pmatrix} \delta & 0 \\ 0 & \delta \end{pmatrix},$$

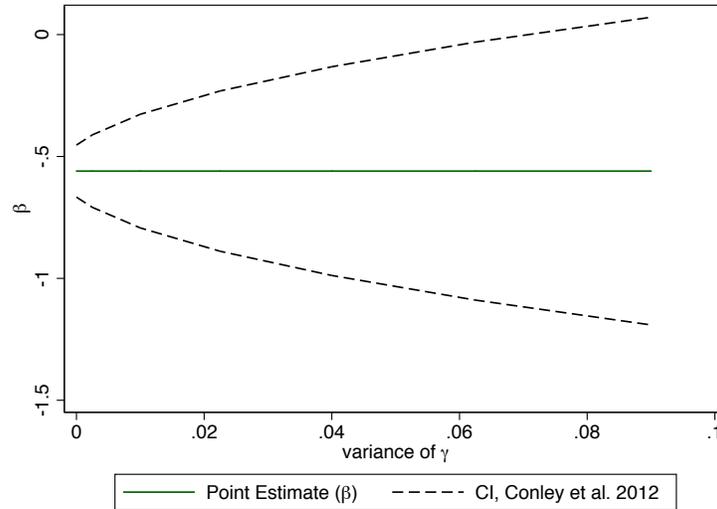


Figure 5: Relaxing the exclusion restriction

with  $\delta \geq 0$ . By considering different values for  $\delta$  we are able to identify the threshold at which the second-stage coefficient on (instrumented)  $REL_{INT} \times LIB_{50}$  becomes insignificant at the 10% level. Figure 5 presents our results. The solid line in Figure 5 depicts the point estimate of  $\beta_2$  (the coefficient associated to  $REL_{INT} \times LIB_{50}$ ) corresponding to column 10, Table 1. The dashed lines report the confidence bounds (at the 10% confidence level) of  $\hat{\beta}_2$  computed for different values of  $\delta$ . The picture shows that increasing the value of  $\delta$  increases the width of the confidence interval of  $\hat{\beta}_2$ . Still, the estimate remains significant for considerably large values of  $\delta$ . We identify a threshold for  $\delta$  equal to 0.071 (which corresponds to a standard deviation of .27). Thus, the conclusions in the main text remain robust even if the direct effect of the instrument on the dependent variable is considerably large.