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# **Secularization and religiosity: a computational psychological perspective**

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## **Abstract**

The influence of secularization upon religiosity remains hotly debated: some scholars conclude that secularization bolsters faith while others claim the opposite. We contribute to this literature by investigating the psychological mechanisms through which secularization might affect religiosity. These processes have been rarely examined, yet their understanding is fundamental. First, we dissect the concept of secularization into its components, identified as presence of lay (and not religious) ruling institutions, prevalence of economic (and not traditional) ties, religious tolerance, widespread scientific culture, and religious heterogeneity. Second, the notion of religiosity is re-casted as a tendency to interpret events in religious versus non-religious terms. Third, we introduce a computational theory about the psychological mechanisms underlying religiosity, which provides the basis for analysing how secularization might influence religiosity. The emerging picture is multifaceted, as different elements are predicted to exert different influences. Secularization of ruling institutions and scientific culture are predicted to suppress religiosity, whereas emergence of economic ties is predicted to bolster religiosity. The influence of religious tolerance is predicted to depend on the perceived strength of the regime. Finally, religious diversity is predicted to be uninfluential. Altogether, this paper highlights insights offered by a computational psychological perspective about the impact of secularization over religiosity.

**Keywords:** religion; secularization; psychology; computational modelling; Bayesian

## **1. Introduction**

Secularization is defined as a process whereby the influence of religious institutions over ruling organs progressively diminishes (Chaves, 1994; Swatos & Olson, 2000). This process is often accompanied by changes occurring both at the social and cultural level (Swatos & Olson, 2000). At the social level, relationships shift more and more from traditional to economic ties. This often promotes migrations and the development of multiethnic societies, leading (together with higher religion toleration) to higher religious heterogeneity. Culturally, technical and scientific knowledge develops and spreads among people. At present, it remains hotly debated whether secularization, characterised by such institutional, social and cultural facets, is also accompanied by decreased religiosity at the level of single individuals, beyond the level of institutions (Bruce, 1999; 2011; Gorski & Altinordu, 2008; Norris & Inglehart, 2004; 2015; Stark, 1999; 2015; Warner, 2010). In other words, do individuals become less religious in secularized societies? Classic authors such as Tylor (1871) and Fraser (1890) confidently expressed an affirmative answer to this question. They viewed human history as driven by progress, whereby primitive forms of religiosity such as shamanism are replaced by more abstract belief systems such as monotheistic faiths. In turn, the latter would be eventually supplanted by science. Although at the beginning of the twentieth century such positivistic outlook was abandoned, the view about the effects of secularization on religiosity endured (e.g., Berger, 1967; Dobbelaere, 1984; Martin, 1969; Wilson, 1969). However, some recent empirical studies have failed to find an association between decreased religiosity and secularisation (e.g., Gorski & Altinordu, 2008; Stark, 1999; 2015). Hence, the implications of secularization for individuals' religiosity remain hotly debated.

We argue that this debate would benefit from framing the problem in psychological terms. Such perspective appears promising because, ultimately, any influence of secularization upon individuals' religiosity will have to be mediated by psychological processes. Hence examining

such processes appears as paramount. Surprisingly, such psychological perspective has rarely been adopted, and there is poor understanding of how secularization might affect the psychology underlying religiosity. This paper aims to fill this gap. First, a brief description of the current debate about secularization, religiosity, and their relationship is presented. This reveals that a critical problem of the debate is about the definition of both the concept of secularization and religiosity. We propose to break down the complex concept of secularization in its components, and to analyse each individually. Next, we focus on religiosity and, after examining the different ways to express this concept, we propose a definition of religiosity as indicating how often an individual relies on religious interpretations of events. We will argue that, within a psychological perspective, this definition can shed light on important aspects. Next, we analyse the psychological processes underlying religiosity. This argument is developed in the context of a recent computational model of religious reasoning referred to as Bayesian Decision Model of Religion (BDMR; Rigoli, 2021). Finally, we will explore how, within the BDMR framework, the different facets of secularization might affect religiosity, and we will examine this with regard to empirical observations and novel predictions. Lastly, the broader implications of our computational psychological approach will be discussed.

## **2. Secularization**

The literature about the impact of secularization upon religiosity is vast and has a long history that can be traced back to the infancy of religious studies (Casanova, 2007; Swatos & Olson, 2000; Warner 2010; Tylor, 1871; Fraser, 1890). Though a detailed overview of this literature is beyond the scope of the manuscript, a broad categorization can be proposed distinguishing early accounts (Berger, 1967; Dobbelaere, 1984; Martin, 1969; Wilson, 1969), with a focus on theory, from more recent accounts combining both theory and empirical observations (Bruce,

2011; Gorski & Altinordu, 2008; Finke & Stark, 1992; Norris & Inglehart, 2004; 2015; Stark, 1999; 2015). While, almost unanimously, early accounts postulated a progressive weakening of religiosity with secularization (although the processes advocated as responsible varied for different authors; Berger, 1967; Dobbelaere, 1984; Martin, 1969; Wilson, 1969), more recent accounts have reported conflicting empirical observations (Gorski & Altinordu, 2008). Among the most important results are the findings that in recent decades (putatively characterised by secularization in many countries) religiosity has generally diminished in Europe (though remaining important) (Boulard, 1982; Brown, 2001; Crockett & Voas, 2006; Holscher, 2005) but it has remained stable, or even increased, in the USA (Finke & Stark, 1992). Moreover, a religious revival has occurred in ex-communist countries, Latin America, and in some Muslim countries (Antoun & Hegland, 1987; Sahliyah, 1990) (note that most of these studies have measured religiosity by asking people whether they profess any religious faith, or whether they participate in any religious activity). Some authors have interpreted these observations as evidence of no effect of secularization on religiosity (Berger, 1999; Finke & Stark, 1992; Stark, 1999, 2015) while other authors conclude that the impact of secularization in suppressing religiosity, albeit not dramatic as previously thought, still exists (Bruce, 2011).

If there is something about which most scholars agree, it is the importance of extending our knowledge about empirical data. We agree with this too, but we also stress the value of further theoretical work. Specifically, we argue that three critical areas necessitate theoretical clarification. First, secularization has often been treated as a monolithic concept, although in reality it comprises a variety of facets. Strictly speaking, secularization refers to a shift from religious to lay ruling institutions (Chaves, 1994). This has been often associated with other processes, including (among others) shift (i) from traditional to economic ties, (ii) from homogeneous to diverse ethnic and religious societies, (iii) from intolerant to more tolerant regimes, (iv) from poor technical and scientific knowledge to wider spread of this knowledge.

Although these facets are usually correlated with one another, their association is far from perfect (Gorski & Altinordu, 2008). Moreover, their effects might not necessarily converge. Hence, a theory of the effects of secularization upon religiosity would benefit from a careful identification of the different facets and from analysing their specific influence. This paper follows this line of reasoning and focuses on five components identified above: ruling institutions, social ties, religious diversity, religious tolerance, and scientific culture.

A second aspect that requires theoretical clarification concerns the definition of religiosity (Hill & Hood, 1999). A common approach consists in asking people to indicate their religious affiliation or lack of affiliation (Hill & Hood, 1999). Another approach widely used is to ask people about their participation in religious activities such as rituals, ceremonies, and prayers (Hill & Hood, 1999). Finally, a third approach is to examine people's general religious beliefs (e.g., belief in Jesus, in after-life, in miracles etc.) (Hill & Hood, 1999). Although these approaches have offered important insight, they are not optimal to assess critical psychological aspects of religiosity. Here we develop a novel perspective that can help shedding light on these aspects. This defines religiosity as a tendency to interpret events in religious versus non-religious terms. The details about this perspective and its implications are examined in the next section.

One last problem that necessitates theoretical work concerns the psychological mechanisms through which secularization would act upon religiosity. This remains underexplored, yet any theory that aims to fully explain the role of secularization will have also to encompass this psychological level. Therefore, one key aim of the paper is to introduce a theoretical model about the psychological processes of religiosity, and rely on this model to elucidate the psychological mechanisms through which secularization, in its multiple facets, might act upon religiosity. The theoretical model about the psychology of religiosity is presented in section four and it is used to explore the impact of secularization in section five.

### **3. Religiosity**

As discussed above, the notion of religiosity can be casted in different ways. The approach we pursue here consists in defining religiosity as how often an individual explains any event (e.g., a war, an illness, the mark to an exam, the performance of the favourite sport team) in religious, compared to non-religious, terms. This approach has at least two advantages. First, when compared to definitions of religiosity with a focus on behaviour (e.g., corresponding to the level of participation in religious practices) (Hill & Hood, 1999), this approach allows a better examination of psychological processes thanks to its emphasis on the psychological dimension. Second, compared to simply asking whether someone identifies with a religion or not (Hill & Hood, 1999), this approach can capture subtler degrees of religiosity. For example, an individual might profess atheism, and yet often come up with explanations of events that are religious in all respects. Another individual might profess strong faith but rarely rely on religious interpretations. Third, our approach can be compared to methods probing general religious beliefs (e.g., belief in Jesus, in after-life, in miracles etc.) (Hill & Hood, 1999). Though both focus on the psychological dimension, the emphasis of our approach is about more specific reasoning processes (based on comparing religious and non-religious interpretations), and it can encompass beliefs about any event (potentially, also everyday life events) and not only about strictly religious issues.

Religiosity conceived as a tendency to rely on religious versus non-religious interpretations can be operationalized straightforwardly. For example, individuals can be presented with a set of events, and for each event they can be asked to select their favourite explanation from a pre-specified set, where some explanations are religious and others are non-religious.

To elucidate further the theory behind our perspective, and clarify the nature of religious and non-religious interpretations, consider three different ways to interpret any event, such as that

an illness has been contracted. First, the event can be interpreted as the consequence of impersonal and deterministic factors. In our example, the illness could be viewed as the result of physical contact with an infected patient, followed by viral transmission and elicitation of an immune response. This type of interpretation is deterministic in as much as the factors involved are thought to fully account for the event. Within such view, identifying all causal factors might be acknowledged as impossible in practice, but still possible in principle: if all relevant factors were known, then the event would be predicted with no error. This non-religious-deterministic perspective is typical of the scientific approach during early modernity (Porter & Ross, 2003).

The second way to interpret an event also relies upon impersonal factors, but now advocating a key role for chance. This perspective conceives events as intrinsically probabilistic. In our example, factors such as contact with an infected patient remain influential but do not suffice to explain the event. Irreducible randomness, conceived as intrinsic in the world, would also play a role. According to this view, even when all relevant factors are known, there will be still some error in predicting an event. This non-religious-probabilistic perspective has replaced a non-religious-deterministic outlook in many scientific disciplines, such as in quantum physics (Porter & Ross, 2003; Saunders, 1998).

The third way to interpret an event (a religious explanation) calls upon supernatural agents such as spirits or gods. Although other factors might still be important, supernatural intervention is ultimately conceived as the key determinant. In our example, contact with an infected patient and other impersonal factors result in illness only if divine intervention allows them to do so. The way such religious explanations work is illustrated by the anthropologist Evans-Pritchard when describing his sojourn with the Zande people in Sudan (Evans-Pritchard, 1937). One day, the roof of a mud house collapsed. This event was interpreted in terms of witchcraft by locals, commenting that people under the roof at that time of collapse must have had powerful

enemies. Evans-Pritchard argued that there was nothing mysterious about the episode: simply, termites were likely to be responsible. However, local people asked why, although of course termites were part of the explanation, the roof collapsed at that precise moment when so-and-so was sitting underneath. Witchcraft seemed to provide a reasonable explanation. This example illustrates well how, according to the Zande's way of reasoning, natural factors such as termites, albeit important, kick in only under the intervention of supernatural forces.

To illustrate further the difference among non-religious-impersonal, non-religious-probabilistic, and religious interpretations, we can reflect on the notion of residual in statistics, and examine different ways to interpret it (Lindley, 2000). A residual is the difference between what is observed (e.g., an actual person's height) and what is predicted from a statistical model based on knowledge of some relevant variables (e.g., mother's height, father's height, age, etc.). A non-religious-impersonal view would interpret residuals as dependent on some unknown natural variables. In principle, gathering knowledge about all such relevant variables would fully explain away residuals. On the contrary, non-religious-probabilistic explanations postulate that residuals are ultimately irreducible: furthering knowledge can help reducing residuals, but it will never cancel them out completely. Finally, a religious explanation interprets residuals as ultimately being the expression of divine action (Polkinghorne, 2007). Even when all relevant natural causes are known, an observation might deviate from predictions because of the intervention of supernatural forces. Many religious phenomena can be interpreted as reflecting religious interpretations of residuals. For example, divination has played an important role in a variety of geographical and historical contexts (Tedlock, 2006). A divination ritual focuses on a phenomenon which is not fully predictable from natural contingencies. A religious interpretation is implicit here, because the observed phenomenon is assumed to depend on divine intentions, in addition to natural forces.

In short, we propose that people can rely on one among three different ways to interpret events: non-religious-deterministic, non-religious-probabilistic, and religious. Based on this, we cast the question of whether secularization discourages religion or not as the question of whether secularization favours non-religious interpretations (deterministic or probabilistic) over religion interpretations among common people. Before we address this question, the next section explores the psychological processes behind religious reasoning, which underlie the emergence of religious or non-religious explanations.

#### **4. The model**

In order to understand whether secularisation favours religious or non-religious interpretations of events (which corresponds to our definition of religiosity), it is paramount to have a theory of the psychological processes underlying the formation of such interpretations. A mathematical model of religious reasoning (i.e., the process through which religion beliefs are formed) has been recently proposed that can provide such framework (Rigoli, 2021). Although common in cognitive psychology, a mathematical approach has rarely been adopted for studying religion. Yet, this can offer a clear and formal description of the key processes involved. The model is based on a formalism called Bayesian decision theory (Bishop, 2006), hence it is called Bayesian Decision Model of Religion (BDMR). The BDMR focuses on the mechanisms through which individuals arbitrate between two alternative hypotheses for explaining aspects of life and reality. For example, one hypothesis might claim that an illness expresses God's punishment for recent misbehaviour (a religious hypothesis), and the alternative hypothesis that an illness is due to a frequent interaction with an infected patient (a non-religious hypothesis). According to the BDMR, three factors are critical to establish which of these hypotheses will be endorsed. The first factor is represented by prior beliefs, namely

relevant knowledge already available before reasoning. Prior beliefs can capture a variety of aspects such as general beliefs about the world or society, expectations learnt from experience, and tendencies to interpret events in specific ways which have been shaped by evolution. For example, one prior belief might be that God often intervenes in people's life to guide their behaviour, and the alternative view that God is usually uninterested in mundane affairs. Someone entertaining the former prior belief will be more likely to accept the hypothesis that the illness reflects God's punishment.

According to the BDMR, the second critical factor for religious reasoning is represented by novel available evidence. For example, one might have a dream about God blaming the person, and this might be interpreted as evidence supporting the hypothesis that the illness reflects God's punishment. Evidence might also be conveyed by social sources: for example, a family member might express an opinion which might be relied upon when arbitrating between the alternative hypotheses.

The third critical factor for religious reasoning proposed by the BDMR is represented by the outcome (in terms of reward or punishment) expected if any hypothesis is accepted or rejected. In our example, an individual would assess the outcome expected to occur (i) if the religious hypothesis is true and is accepted (and time is spent praying; assuming that praying can win God's help for healing), (ii) if the non-religious hypothesis is true and is accepted (and time is not spent praying; assuming that praying is time-consuming and hence costly), (iii) if the religious hypothesis is false but is accepted (and time is spent praying) (iv) if the non-religious hypothesis is false but is accepted (and time is not spent praying). To understand the influence of expected outcomes, compare two different individuals both arbitrating between the two hypotheses in the example above. A first individual might not be frightened at all by the illness. Such indifference would imply a large cost if the religious hypothesis is accepted (and time is spent praying for receiving God's help to heal) but the hypothesis turns out to be false (and

hence praying turns out to be useless). On the contrary, a second individual might be extremely frightened by the illness. For this person, a large cost occurs if the religious hypothesis is rejected (and God is not prayed for receiving help to heal) but the hypothesis turns out to be true (and hence God's favour is not won). According to the BDMR, these evaluation processes are critical because the first individual will be more likely to accept the non-religious hypothesis, while the second individual will be more likely to accept the religious hypothesis. Note that the definition of reward and punishment proposed by the model is very flexible, encompassing multiple forms of values such as fostering community bonds, promoting own group's power, supporting moral rules, etc.

Altogether, according to the BDMR religious reasoning is based on integrating information from prior beliefs, novel evidence, and expected outcomes. The result of this process is the selection of one hypothesis. Note that, because of the influence of expected outcome, a hypothesis might be selected because it is the costliest to reject even though it is not the best supported by evidence and prior beliefs. However, prior beliefs and novel evidence remains fundamental, and a hypothesis will be less likely to be accepted if it is poorly supported by them. In other words, the BDMR conceives religious reasoning as the result of integrating both accuracy (afforded by prior beliefs and novel evidence) and affective (afforded by expected outcomes) factors.

What is the phenomenological implication of accepting one hypothesis over the other? The BDMR proposes that the implication is that, phenomenologically, an individual will believe that the accepted hypothesis is true even if, as explained above, it does not necessarily enjoy more support from evidence. In other words, the BDMR postulates that agents are blind to the inference/decision process described above; they simply perceive the accepted hypothesis as true, without being aware that their perception is ultimately the product of utility maximization. In other words, the model assumes a form of motivated reasoning (Kunda, 1990; Willer, 2009)

or self-deception during belief formation. Why should self-deception occur? Following Trivers (2011), in an evolutionary perspective beliefs can be understood as having a fundamental pragmatic nature in as much as they enable one to achieve goals. To be effective, beliefs would need to satisfy three fundamental requisites. First, they would need to describe the world accurately, an aspect the BDMR captures by attributing importance to evidence and prior beliefs (if these are ignored, goals will not be obtained). Second, they would need to take utility into account, also in line with the BDMR. Third, because humans are primarily social animals, beliefs will need to persuade others. Only if this occurs, beliefs will ultimately be effective. In this perspective, self-deception during reasoning might have evolved as an effective strategy to persuade others (a possibility which has received empirical support; Smith et al., 2017; Schwardmann & Van der Weele, 2019).

In short, the BDMR assumes that prior beliefs, novel evidence and expected outcomes all concur to religious reasoning. This implicates that religious reasoning is conceived as integrating accuracy (afforded by prior beliefs and novel evidence) and utility (afforded by expected outcomes) drives. After introducing the BDMR, we can now turn to the key question of the paper. Adopting the BDMR as framework, are religious or non-religious explanations favoured in secularized societies? This question is explored in the next section.

## **5. The impact of secularization upon religiosity**

By definition, secularised societies are ruled by lay institutions, while in the regime of non-secularized societies religious institutions exert a pivotal role (Chaves, 1994). Other features often associated with secularisation are a primacy of economic over traditional ties, religious diversity, religious tolerance, and widespread technical and scientific knowledge (Swatos & Olson, 2000). We argue that, in order to fully understand the impact of secularisation, it is

important to segregate these different components and explore each individually. How is each of these features expected to influence religious reasoning (assuming the BDMR as framework)? Below, we address this question for the different facets of secularization.

### **5.1 Ruling institutions**

In many different ways such as when promulgating laws, ruling institutions offer interpretations of public life to common people; these interpretations are arguably more often religious when they come from religious compared to secularised ruling institutions. Interpretations proposed by ruling institutions are likely to influence many people's reasoning (within the BMDR, this influence is captured by novel evidence provided by social actors). Hence, comparing societies where religious institutions rule versus societies where secular institutions rule, the former are predicted to foster more religious interpretations among common people. Because of its emphasis on motivated reasoning, the BDMR suggests that ruling institutions might exert also another type of influence. In societies ruled by religious institutions compared to societies ruled by secularised institutions, common people might subconsciously reason that religious explanations are costlier to reject (e.g., in terms of their social or political own interest). For example, in a society ruled by religious institutions, religious explanations might be more appealing for someone interested in a political career.

In sum, according to the BDMR, the main feature of secularization (secularised versus religious ruling institutions) is predicted to discourage religiosity among common people. In order to assess this prediction, it is essential that future research isolates this aspect from the other aspects analysed below, for example employing statistical methods which allow controlling for multiple independent variables.

## 5.2 Religious tolerance

Another feature often distinguishing secularised versus non-secularised societies is religious tolerance versus intolerance. When a regime is strong, the BDMR predicts that the appeal of religious beliefs promulgated by ruling institutions (i.e., “official” religious beliefs) will increase in societies that are intolerant towards “non-official” beliefs. Religious intolerance would render official religious beliefs more attractive for common people because disincentives are predicted following rejection of these beliefs. However, the BDMR predicts that religious intolerance has paradoxical effects, and ends up disqualifying the beliefs it strives to impose, when a regime is weak and a discriminated religious community is strong. This occurs when many common people predict that intolerance will anger the powerful discriminated community and ultimately provoke a regime change, implying that advantages (e.g., in terms of social or political own interest) are foreseen by supporting the discriminated religious community. For example, this might apply to many Irish people at the time when Ireland was fighting for independence from the United Kingdom. These people might have embraced Catholicism against the official Anglicanism because they foresaw independence as likely. Similar processes might explain the Catholic revival in Poland right before the fall of the Communist regime in that country. In this case, intolerance of Catholicism exerted by a secularised Communist regime might have spurred Catholic revival at a time when many foresaw the possibility that Catholic political movements could overthrow that regime.

In short, the BDMR proposes that the effect of religious intolerance upon religiosity depends on the regime’s strength vis-a-vis discriminated religious communities, predicting that intolerance is effective when discriminated communities are weak, and it fails when discriminated communities are powerful. Interestingly, the BDMR can also accommodate the possibility that sometimes religious intolerance fails despite weakness of discriminated religious communities. This might occur when a persecuted religion praises individuals for

maintaining their faith despite being threatened by an intolerant regime. From these individuals' perspective, punishment from an intolerant regime might ensure much larger rewards such as eternal beatitude. A similar perspective might characterise some early Christians whose faith was strengthened by the prospect of martyrdom at the hands of Romans.

### **5.3 Social ties**

Secularised societies often witness the breaking-down of traditional ties based on family, locality, and hierarchy, and the formation of relationships based on economic exchange. What are the implications of this for people's religiosity? A key aspect of traditional societies is their hierarchical nature. Within the BMDR, this means that beliefs held by people higher in the hierarchy are more influential (in the model, this influence is captured by novel evidence provided by social actors). In itself, this does not favour or disfavour religiosity. Rather, this modulates the influence of ruling institutions: in hierarchical societies, ruling institutions are more influential because they are at the top of the hierarchy. Hence, when ruling institutions are religious (an aspect often characterising non-secularised societies), hierarchical societies are predicted to foster religiosity more than non-hierarchical societies.

Another implication of economic versus traditional ties for religiosity can be predicted by assuming that a fundamental human motive is to establish stable and trustworthy social relations (Baumeister, 1991; Krause & Wulff, 2005; Pargament et al., 1983). Economic relationships have a more volatile and precarious nature than traditional ties. Hence, when society relies on economic relationships, participation to a religion community might be viewed as a way to foster more stable and trustworthy social relations, and the appeal of religion beliefs might henceforth increase.

Linked to this is the prediction that religious faith is bolstered by societies that leave their members in uncertain conditions with respect to important life domains such as health, work, and education (Norris & Inglehart, 2004; 2015). This has been supported empirically by observations of a positive link between social uncertainty and faith (Norris & Inglehart, 2004; 2015). The BDMR fits with this prediction because it proposes that, when societies do not guarantee security, individuals will often seek support from religious communities by embracing their faith. This explanation is different from proposals arguing that social uncertainty bolsters faith because, by providing comforting beliefs (e.g., the belief in a happy afterlife), faith suppresses anxiety (Kay et al., 2010; Norris & Inglehart, 2004; 2015). The BDMR does not fit with this explanation; rather, it emphasises the social incentives that religion communities can provide in socially uncertain conditions (Baumeister, 1991; Krause & Wulff, 2005; Pargament et al., 1983).

In short, according to our examination, economic ties are an example of an aspect typical of secularised societies which (without considering its interaction with ruling institutions) is likely to promote religiosity. Further research is required to assess this prediction by isolating the influence of this variable from the other elements of secularization.

#### **5.4 Religious diversity**

Partly because of their emphasis on economic ties, partly because of higher tolerance, secularised societies are often characterised by higher religious diversity. Early theories of secularization predicted that religious heterogeneity discourage religiosity (Berger, 1967; Dobbelaere, 1984; Martin, 1969; Wilson, 1969). Their argument was that the coexistence of multiple religious perspectives would highlight the fact that religion is subjective in nature, eventually undermining religiosity altogether among common people. Some recent scholars

have advocated the opposite (Finke & Stark, 1992; Stark, 1999, 2015). Their proposal was that, in religiously diverse societies, different religious groups compete in developing appealing explanations of events. Such competition would develop religious beliefs with broader appeal, leading to an overall increased religiosity among common people.

The BDMR departs from both earlier and more recent accounts as it does not contemplate any impact of religious diversity. This model proposes that social sources are critical in belief formation in such a way that, the larger the number of people supporting a belief, the more likely an individual will be to endorse that belief. The ensuing implications regarding the impact of religious diversity upon religiosity can be explained as follows. Assume a population with  $n$  people, where  $z$  corresponds to the number of people endorsing a religious explanation of an event, and where  $n-z$  corresponds to the number of people endorsing a non-religious explanation. Note that the value  $z$  can also be conceived as equal to the level of religiosity of the population. Consider the case where there is only one religion explanation competing against the non-religious explanation. According to the BDMR, the likelihood that a new member of the population will embrace the religion explanation (this can be considered a way to measure change in religiosity) will be equal to  $z/n$ . Consider now the case where two competing religious explanations are available (an example of higher religious diversity), each endorsed by  $z/2$  people. Note that the total level of religiosity does not change, as the total number of people accepting any religious explanation remains  $z$ . The likelihood that a new member of the population will embrace the first religious explanation will be equal to  $z/2n$ ; an equal value is obtained for the likelihood of accepting the second religious explanation. The total likelihood for embracing any religious explanation remains equal to  $z/n$ ; therefore, according to the BDMR, the overall change in religiosity of the population is not affected by religious diversity.

Following arguments proposed by previous literature (Finke & Stark, 1992; Stark, 1999, 2015), one can argue against this by suggesting that religious diversity leads to developing more appealing religious interpretations. In our example, for a new member of the population this would lead to a likelihood higher than  $z/2n$  of accepting any of the two religious explanations. However, one fundamental problem of this argument is that, if religious diversity in fact boosts competition and the appeal of interpretations, this would also apply to non-religious interpretations. As a result of competition, though all interpretations (religious and not) would look more attractive, nevertheless their relative attraction would remain unaffected, hence resulting in the BDMR predictions of no effect of religious diversity upon religiosity.

In short, contrary to most previous theories of secularization, the BDMR does not postulate any impact of religious diversity over religiosity. Note that different predictions arise if different assumptions are made; for example, assuming that smaller (or larger) religious communities develop explanations that are proportionally more appealing. Religious diversity has rarely been investigated independent of other aspects of secularization. Hence its specific influence over religiosity remains to be explored empirically, and it remains to be established if this fits with BDMR predictions or not.

## **5.5 Scientific knowledge**

Secularised societies are characterised by more widespread scientific culture. By definition, science relies on non-religious (deterministic or probabilistic) explanations and rules out religious ones. Therefore, it is to be predicted that, in societies where scientific culture is more widespread, individuals will show an increased tendency to interpret events adopting non-religious, instead of religious, explanations. This prediction arises from the BDMR, where in societies with widespread scientific culture non-religious hypotheses will be associated with

higher prior probability. Other things being equal, high prior probability for non-religious hypotheses implies an increased tendency to accept these at the expense of religious ones.

The notion that scientific culture promotes non-religious versus religious explanations is supported by empirical evidence, albeit circumstantial. For example, it has been argued that during antiquity and the middle ages, common explanations of illness combined religious and non-religious elements (Biller & Ziegler, 2001; King, 1999). On the contrary, although religious interpretations remain appealing in societies with strong scientific culture, the scientific medical approach, which rules out religious interpretations, prevails in these societies.

In short, spreading of scientific knowledge is predicted to support non-religious interpretations at the expense of religious ones. Although, at least circumstantially, empirical observations support this (Biller & Ziegler, 2001; King, 1999), the impact of scientific culture remains to be investigated systematically and independent of other aspects of secularization.

## **6. Discussion**

This paper develops a computational psychological perspective to investigate whether secularization influences religiosity among common people. The aim is to clarify the psychological mechanisms through which the different facets of secularization might impact upon religiosity. As prerequisite, this requires spelling out two critical concepts. First, the complex notion of secularization needs to be dissected into its components, identified here as the presence of lay versus religious ruling institutions, prevalence of economic versus traditional ties, higher religious tolerance, widespread scientific culture, and higher religious heterogeneity. Second, a definition of religiosity that captures its psychological roots needs to

be formulated; here this concept is casted as a tendency to interpret events in religious versus non-religious terms.

After clarifying the key concepts, we introduce a theoretical model (the BDMR) about the psychological mechanisms underlying religiosity. This provides the basis for our theory about the influence of the different elements of secularization upon religiosity. The emerging picture is multifaceted, as different elements are predicted to exert different type of influence. Secularization of ruling institutions and scientific culture are predicted to suppress religiosity, whereas emergence of economic ties is predicted to bolster religiosity. The influence of religious tolerance is predicted to depend on the perceived strength of the regime, with intolerance favouring religiosity when regimes are strong and disfavouring religiosity when regimes are weak. Finally, when isolated from other components, religious diversity is predicted to be uninfluential.

One central aim of this paper is to inspire theoretical and empirical research. At a theoretical level, a research avenue is to clarify further the notion of secularization, for example by identifying other facets of this concept. Based on previous accounts, we have focused on five key elements, but arguably other facets might be important. The paper also encourages future research to focus on the psychological level, a key aspect overlooked so far. Empirically, several specific novel predictions arise. Testing these requires developing methods to operationalize the different variables, to measure them in different societies, and to analyse them adopting statistical methods (e.g., multiple regression) which isolate the influence of each from the others.

In sum, despite a vast literature about the effects of secularization, the psychological processes through which secularization operates remain poorly understood. Here we propose a theory of these processes that can inspire theoretical and empirical research, thus contributing to

understand the role of religion in society during the past and the present, and to understand how this might evolve in the future.

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