

## CHAPTER NINE

### EVOLUTION AND THE UPCOMING CHALLENGES OF A PREDICTABLE LANDSCAPE

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In Chapter One we stated that, based on current scientific evidence, 100% of all peoples worldwide should accept the concept of evolution. We argued, however, that due to the inherent incompatibility between scientific rationalism/empiricism and the belief in supernatural causation, the controversy over evolution-and-science versus creationism did — predictably— emerge. And that this conflict shall turn everlasting for as long as belief in the supernatural continues to persist in society and science continues to challenge it (Paz-y-Miño-C and Espinosa 2013a, 2014a, b, 2015). We also remarked that, although the evolution controversy was primarily triggered by *the* factor *religion*, the societal struggles around evolution's acceptance were multi-factorial and complex, including the variables: religious beliefs, pro-life beliefs and political ideology (Miller et al. 2006; see also Box 5.1, Chapter Five); or political activity, political and religious conservatism, knowledge about evolution and its relevance, creationist reasoning, evolutionary misconceptions, and exposure to evolution (Hawley et al. 2011; Box 5.1); or religious affiliation, frequency of attendance to religious services, college academic level, exposure to evolution in high school, and college major (Rissler et al. 2014; Box 5.1). In addition, in Figs. 1.3 and 1.4 (Chapter One), we reported the close correlation between public acceptance of evolution and wealth (the latter represented by Gross Domestic Product, GDP) and public level of religiosity as function of GDP, respectively. Thus, the reader should know, by now, that acceptance of evolution, and the phenomenon of the evolution controversy, occur in a multi-dimensional landscape, or landscapes.

What will be the societal setting in which science/evolution and religion interact in the future? Before addressing this question, we remark that societal interactions between science and ideology are intricate, and

subject to public policy, law, and abrupt socio-economic change (Paz-y-Miño-C and Espinosa 2011a, 2013b, 2015; see also Chapter Two). Below, we sketch a probable world socio-cultural environment —based on statistical demographic projections— in which acceptance of science and evolution could take place in the future.

By the 2050s or 2060s, the world societal dynamics will be quite different in respect to today's, particularly in four relevant landscapes associated with attitudes toward science and evolution: distribution of wealth, education, migration, and demographics of religious groups.

### **Distribution of Wealth**

In Chapter One, we discussed the association between wealth, as per capita Gross Domestic Product (GDP), and public acceptance of evolution across exemplar world nations (see Fig. 1.3). Except for the U.S. (a notorious outlier), higher GDP correlated with higher evolution's acceptance. The top ten countries in which public acceptance of evolution was close to 70% —or higher— were Iceland, Denmark, Sweden, France, Japan, U.K., Norway, Belgium, Spain and Germany (Figs. 1.2 and 1.3). The per capita GDP in these nations was around, or much higher than, 30,000 US\$ (as per 2006, the source of the data in Fig. 1.3). At the bottom of the list (i.e. public acceptance of evolution below 60%) were Austria, Croatia, Romania, Greece, Bulgaria, Lithuania, Latvia, Cyprus, U.S. and Turkey (Figs. 1.2 and 1.3). Except for the U.S. (GDP just below \$50,000), Austria (GDP \$40,000) and Greece (GDP \$30,000), the other 7 nations' GDPs were around, or below, \$20,000 (Fig. 1.3).

The crucial point to consider is that GDP is an overall indicator of the relative socio-economic affluence of a country (within its boundaries) in respect to other countries. Wealthier nations often provide prosperity to their citizens, particularly in education (see *Education*, below), which "level of attainment" is highly correlated with acceptance of evolution (Chapters One-Three, Six and Seven; see also Figs. 2.2, 7.3, 7.4, 7.6, 7.7). In addition, richer nations tend to be less religious (Fig. 1.4), and, as we have examined it in this book, low religiosity correlates with high support to evolution (Chapter Two). For example, the top ten countries listed above, which acceptance of evolution was around 70%, or higher, were the least religious (i.e. on average, 70% of the people in these nations "did not believe in any sort of spirit, God or life force," and 30% of the population had no religious affiliation; data extracted from Pew Research Center 2012

and supplemented with Special Eurobarometer 2010). In contrast, the bottom ten countries listed above, which acceptance of evolution was below 60%, were the most religious (i.e. on average, only 31% of the people in these nations "did not believe in any sort of spirit, God or life force," and only 8% of the population had no religious affiliation; Pew Research Center 2012; Special Eurobarometer 2010). Therefore, wealthier nations, which offer means to their citizens, higher quality of education, and happen to be less religious, embrace higher support to evolution than their counterparts at the bottom of the spectrum. Note, however, that exceptions, like the U.S., can and do occur (but see projections about acceptance of evolution for the U.S. based on *Migration and Demographics of Religious Groups*, below).

Can we predict anything about the future of acceptance of evolution based on distribution of wealth? Here, average values matter and, in the case of global wealth distribution, the representation of the middle class, in respect to the low- and high-income strata, is informative. The middle class, if educated and numerous, is the sustain of a dynamic socio-economic system. However, the Pew Research Center (2015a) states that the emergence of a truly global middle class is still more promise than reality. By 2011, 56% of the world's population continued to live at low-income (\$2-10 daily), and only 13% were middle income (\$10-20 daily). Although the mid-income population grew from 7% to 13%, between 2001 and 2011, the improvement was restricted to China (its middle-class grew from 3% to 18%), South America (from 17% to 27%; but note that the South American recovery was temporary, current trends forecast the region to fall, again, into a recession; Latinobarómetro 2015) and Eastern Europe (from 24% to 40%). Income inequality barely changed geographically during the same decade. In 2001, 91% of the global high-income people were living in North America and Europe; by 2011, this geographic placement had only decreased to 87% (see Box 9.1). Although the poor global population (surviving on \$2 or less daily) dropped from 29% to 15% in the same time period, 71% of the world continued to bear poor and/or low income existence. In fact, 26 countries that managed to reduce poverty in a range of -15 to -45 points (percentage) continued to experience little social mobility in the middle-income populations (Pew Research Center 2015a).

The yearly earnings varied among income groups: \$2,920, or below, for the poor stratum; from this value up to \$14,600 for the low-income class; from this value up to \$29,200 for the middle-income class (keep in mind

that \$23,021 is the poverty line in the U.S.); from this value up to \$73,000 for the upper-middle income class; and above this value for the high income class. By 2011 only 29% of people worldwide belonged to the middle-, upper-middle, and high-income groups (combined values; Pew Research Center 2015a).

**Box 9.1.** Upper-Middle and High-Income Distribution in North America and Europe vs. Acceptance of Evolution.

In contrast to most countries, the U.S., Canada and the Western Europe nations belong to the upper-middle and high-income side of the spectrum of income and wealth distribution (average year earnings = \$73,000 and higher). Between 2001 and 2011, the middle class decreased slightly in North America and Western Europe: U.S. from 8% to 7%, Canada from 9% to 6%, and Western Europe from 13% to 10%. During the same time period, the upper-middle income strata remained the same in the U.S. (31% vs. 32%), decreased in Canada (from 40% to 36%) and Western Europe (from 49% to 43%). And, although the U.S. experienced a small decline of its high-income class (from 58% to 56%), this group increased in Canada (from 49% to 56%) and Western Europe (from 35% to 44%; Pew Research Center 2015a). Despite these changes, relative prosperity prevailed in North America and Western Europe in contrast to the world. The only substantial transformation, from 2001 to 2011, occurred in Eastern Europe: low-income dropped from 61% to 28%, the middle class grew from 27% to 40% (thus catching up with Western Europe), the upper-middle income class increased from 9% to 27%, and the high-income group increased from 1% to 5%.

Except for the U.S., where public acceptance of God-guided human evolution continued to fluctuate around 40% during 2001 to 2011 (The Gallup Poll 2008, 2010, 2012, 2014), acceptance of evolution by the general public in Canada (61%; Angus Reid Institute 2012) and the Western Europe nations (around 70% or higher) continued to be among the highest worldwide as function of per capita GDP (Figs. 1.2 and 1.3, Chapter One). Although, we do expect an increase in public acceptance of evolution in the U.S. for reasons other than wealth distribution (see *Migration and Demographics of Religious Groups*, below), Canada and West Europe shall remain the same in public level of support to evolution. However, if wealth distribution in Eastern Europe continues to improve, benefitting the middle class, as during the decade 2001-2011, we should expect a raise in public acceptance of evolution (beyond the current range of 50% to 60%; Fig.1.2, Chapter One), particularly in the Slovak Republic (middle class increased from 43% to 59%), Poland (from 41% to 46%), Romania (from 6% to 25%), Bulgaria (from 28% to 48%), Lithuania (from 30% to 41%) and Latvia (from 35% to 45%). Keep in mind that, as region, Eastern Europe is among the least religious worldwide (Fig. 1.4, Chapter One).

Transitioning from poor- or low-income to the middle-income stratum seems crucial for societal progress. In more equal societies, middle-income families have greater incentives to invest in education, purchase goods and services, increase their savings, influence socio-political changes, and improve the quality of political institutions (Pew Research Center 2015a). But, because there is no indication that the middle class will grow, substantially, in the immediate future (except for Eastern Europe, see Box 9.1), or that the standards of living will improve for the majority of the world's population, we cannot forecast a global change in public support to evolution associated with distribution of wealth (but see Eastern Europe situation in Box 9.1). Except to confirm that wealthier nations shall continue to have access to high-quality education, be less religious, and accept evolution at higher rates than poorer nations (rationale and data above). In addition, only permanent transformations in the global distribution of wealth, in which the middle class grows ubiquitously and remains prosperous in the long term (e.g. Eastern Europe, Box 9.1), could lead to global changes—for the better—in attitudes toward science and technology, and support to evolution. In parallel, and at the single-country scale, we can only expect that if a nation recovers from socio-economic struggles, brings up its per capita GDP (i.e. grows its middle class and decreases poverty; see examples of Eastern Europe in Box 9.1) and improves its finances for several decades, educational and cultural transformations—including robust support to science and reason—shall follow.

## **Education**

In Chapter Two, we discussed the positive association between level of education and acceptance of evolution. In the U.S., for example, we indicated that public support to evolution increased from the high school (21%), to the some college (41%), college graduate (53%), post-graduate (74%), and university professor levels (95%; Brumfield 2005; The Gallup Poll 2009; Paz-y-Miño-C and Espinosa 2011a, 2012a, b, c, 2013b; Fig. 2.2). As the reader can infer from the previous section (*Distribution of Wealth*), educational attainment—comparably to overall prosperity—correlates positively with per capita GDP (UNESCO-UIS/OECD 2005). In Fig. 9.1 we show this association; note how school life expectancy (i.e. years spent receiving "primary" to "tertiary" education, or elementary school to college/university) is lower in low-GDP nations (GDP below

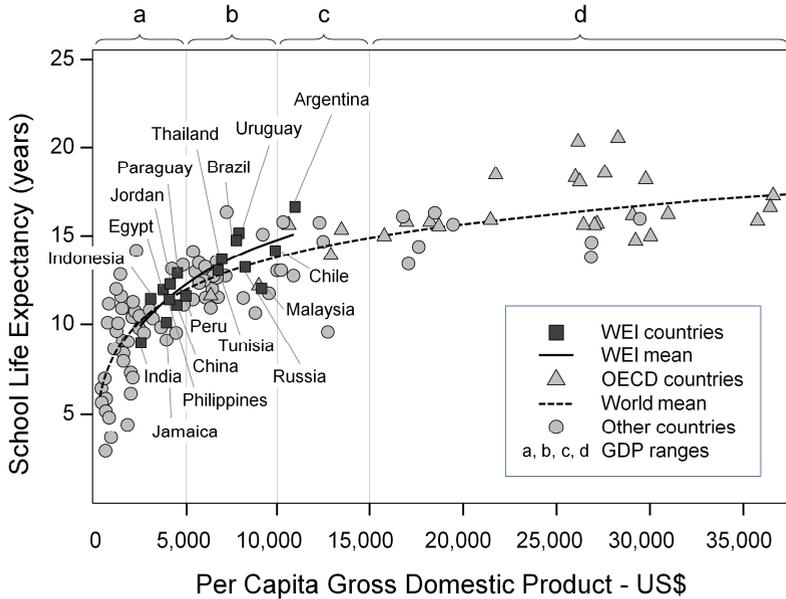


Fig. 9.1 School life expectancy (i.e. number of years spent receiving "primary" to "tertiary" education) as function of per capita Gross Domestic Product GDP. Countries within the World Education Indicators (WEI) have been tracked since 1997. OECD countries (Organisation for Economic Co-operation and Development) and "other" countries have been tracked in more recent years (modified and redrawn from UNESCO-UIS/OECD 2005).

\$5,000 or up to \$10,000) than in higher-GDP nations (GDP from \$10,000 to \$35,000). However, minor improvements in GDP, across countries, particularly in the range \$5,000 to \$10,000, can have substantial impact on years spent receiving education (see the steep slope of the regression curve in GDP range *a*). For example, school life expectancy in countries with GDP below \$5,000 can range from less than 5 years of schooling to close to 15 years (Fig. 9.1, GDP range *a*). In contrast, countries which GDPs ranging from \$5,000 to \$10,000 have narrower amplitude (but more years) of school life expectancy, from 10 to 15 years (Fig. 9.1, GDP range *b*). Wealthier nations (GDP \$10,000 to \$35,000, ranges *b*, *c*, and *d*) offer to their citizens 10 to 20 years of schooling. It is important to highlight that from GDPs above \$15,000, countries consistently offer to their citizens 15 to 20 years of schooling (Fig. 9.1, GDP range *d*). In essence, because educational attainment correlates positively with acceptance of evolution

(exemplar data above), we can only expect significant increase in evolution's acceptance in nations that improve —and sustain the improvement during several decades— their school life expectancies to 15 to 20 years (i.e. college and university education, but see *tertiary education*, below). However, keep in mind that in most countries the average general public still remains at the level of high-school or some-college education (Fig. 9.1, GDP ranges *a* and *b*), which suggests that major progress in the *mean-value* of public support to evolution shall be achieved chiefly via quality high school —science/evolution— education.

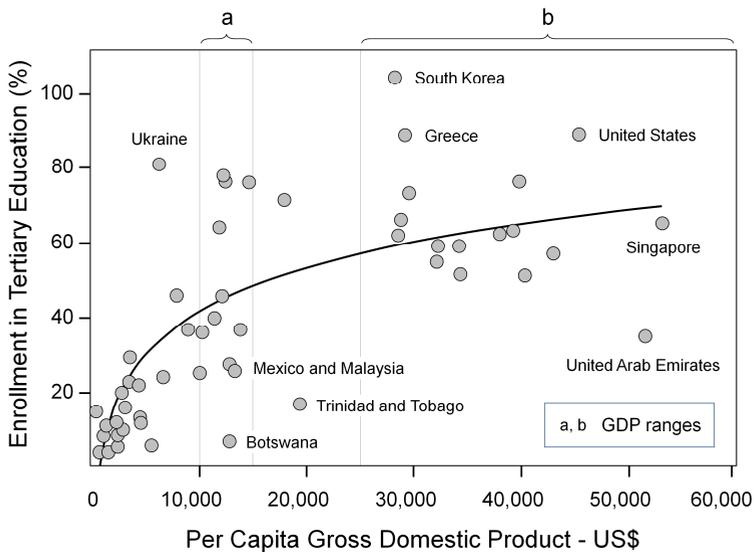


Fig. 9.2 Enrollment in tertiary education (i.e. 2-4-year colleges and universities) as function of per capita Gross Domestic Product GDP. Between \$10,000 and \$15,000 (a), and beyond \$25,000 (b) the range in enrollment can be wide (modified from British Council 2012).

In this context, tertiary education (i.e. post-secondary or post-senior-high school diploma; including 2-4-year colleges, universities, and certified higher-education centers/institutes) needs to be examined since it can transform a *person* into a highly trained, independent critical thinker. Highly educated individuals tend to support science/technology, accept evolution, and are, on average, less religious than the general public (Chapter Six; see also Larson and Witham 1998; Pew Research Center for the People & the Press 2009; Pew Research Center 2009, 2015b). As

plotted in Fig. 9.2, global rates of enrollment in tertiary education also correlate positively with GDP. However —and this is the crucial point— different from primary and secondary schooling, which take place within the boundaries of a country and are subject to local socio-economic constraints, the "industry" of tertiary, higher education is both domestic (driven by in-country students' and national priorities of high standards for colleges' and universities' development) and internationally connected (driven by global trends of collaboration in science and technology; British Council 2012). But the question remains: can highly educated individuals—who are a minority in most of the world's nations; see Fig. 9.1—contribute to transform the broad patterns of nation-by-nation acceptance of evolution? We speculate that this can be the case if a significant share of the international high-skilled professionals become permanent resident-contributors to transforming education, science and technology in the developing world. But the global supply and demand of these experts leads them to settle preferentially in the most prosperous countries, and the data (below) suggests that this phenomenon will only be enhanced in the future (British Council 2012).

By 2009, the world had 170 million tertiary students (i.e. those pursuing higher education); 45% of them (76.5 million) were concentrated in China, India, U.S. and Russia. Emerging economies, at that time, accounted for 12% (21 million) of the global university population: Brazil, Indonesia, Iran, South Korea and Turkey. The supply of international tertiary students grew from 800,000, in the 1970s, to 3.5 million in 2009; and the major source of such students were China, India, South Korea, Germany, Turkey and France. The top destination countries for outbound mobility of university students (60% of them) were the U.S., U.K., Australia, France, Germany, Russia, Japan and Canada (British Council 2012). Fig. 9.3 summarizes the net balance of inbound and outbound tertiary student mobility by 2009.

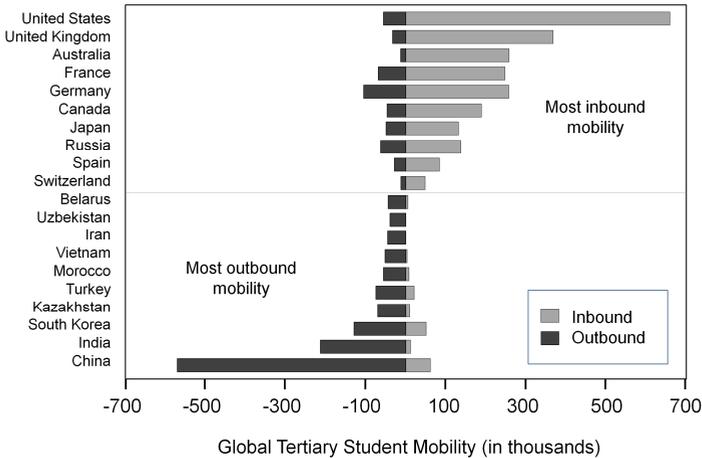


Fig. 9.3 Net balance of inbound and outbound global tertiary student mobility by 2009 (redrawn and modified from British Council 2012).

By 2020, the largest outbound mobile student flows will continue to originate in China (585,000), India (296,000), South Korea (134,000), Germany (100,000) and Turkey (84,000), and it will also include Malaysia (82,000) and Nigeria (67,000). The largest inbound countries by destination will continue to be the U.S. (582,000), U.K. (331,000), Australia (277,000), Canada (176,000), Germany (155,000), and it will likely also include China and Malaysia. In essence, the drives of higher education demands by 2020 will continue to be *place of geographic origin* (of tertiary students as function of outbound and inbound global mobility) and *economics* (GDP; British Council 2012). Already robust economies will continue to attract the top tertiary global students, retain them, and benefit from their high professional skills at the peak of their careers. The internationalization of the *modern university* is such, that the global tertiary education system will continue to operate in a transnational fashion (i.e. Transnational Education TNE; British Council 2012); thus, channelizing most of the gain toward the prosperous economies. Under this landscape, we cannot forecast any major change in the patterns of nation-by-nation acceptance of evolution that could be directly associated with large numbers of mobile international graduates finally settling in the developing world, since this is unlikely. But the possibility does exist that specific nations engaged in vigorous and fast economic growth (i.e. projected to persist by 2050, e.g. Philippines, Egypt, Malaysia, Peru,

Colombia, Pakistan, Bangladesh, Chile, Algeria, Ukraine; Ward 2012) will recruit and retain, large cohorts of international science graduates, who will eventually contribute to a more lasting upgrading of the general public's views about science and technology, and support to evolution. For now, however, it appears that major contributions to increasing evolution's acceptance nation-by-nation shall mainly come from meaningful improvements to the excellence in high school education (i.e. still the prevalent 10-15-year school life expectancy in most countries; Fig. 9.2), rather than from recruitment of tertiary educated professionals from the global pool (a floating population predominantly influenced by the international supply and demand of high-skill jobs; British Council 2012).

## Migration

Migration (immigration: individuals coming in; and emigration: individuals leaving) is a dynamic phenomenon, one that can gradually modify the demographic, socio-economic and cultural landscape of a nation, a region, or the world. Migration can stimulate the integration of ethno-cultural diversities and increase wealth and prosperity (particularly in science and technology), but it can also generate societal tensions, segregation of migrants, exploitation of their labor, inequality and poverty (United Nations 2013). Although in the next section (*Demographics of Religious Groups*) we discuss associations between migration patterns, levels of religiosity and their potential influence on future evolution's acceptance, here we bring the reader's attention to global and regional (particularly the U.S.) trends of peoples' geographic mobility. Our goal is to point at statistical tendencies that could influence, in a foreseeable future, global and regional attitudes toward science/evolution. We advise the reader, however, to seek more in depth information about immigration/emigration in the specialized reports listed at the end of this chapter (i.e. International Organization for Migration 2015a, b; Pew Research Center 2013a, 2015c; United Nations 2013).

Between 1990 and 2013, the number of international migrants increased by 34%, from 154 million to 232 million. In the U.S., migration doubled from 23 million to 46 million during the same time period (Pew Research Center 2013a). In 1990, 33% of the global migrants were born in Europe, a comparable share (34%) in Asian Pacific countries, 11% in Latin America and the Caribbean, 10% in Sub-Saharan Africa, 7% in the Middle East and North Africa, and 2% in North America (the remaining 3% corresponded to other). By 2013, the world international emigration of Europeans

dropped to 26%, in contrast to a noticeable increase of Latin American and Caribbean emigrants (up to 16%) and, to a lesser extent, of Asian-Pacific natives (up to 36%; Pew Research Center 2013a).

By 2013, the top destination world regions of international migrants were: Europe (31%), North America (23%), Asia Pacific (21%), Middle East-North Africa (14%), Sub-Saharan Africa (7%), and Latin America and the Caribbean (4%). In the same year, the top destination countries of international migrants—as per number of foreign-born individuals—were the U.S. (45.8 million), Russia (11.0 million), Germany (9.8 million), Saudi Arabia (9.1 million), United Arab Emirates (7.8 million), United Kingdom (7.8 million), France (7.4 million), Canada (7.3 million), Australia (6.5 million) and Spain (6.5 million). And the top origin countries of such migrants were India (14.2 million), Mexico (13.2 million), Russia (10.8 million), China (9.3 million), Bangladesh (7.8 million), Pakistan (5.7 million), Ukraine (5.6 million), Philippines (5.5 million), Afghanistan (5.1 million) and United Kingdom (5.0 million; Pew Research Center 2013a).

Since public acceptance of evolution correlates positively with wealth (above), and due to the fact that most of the global international migration takes place from developing nations toward wealthier countries (data above), followed by integration of the immigrant population into the local socio-economic and cultural systems, we can only make broad speculations about the future landscape of evolution's acceptance from the perspective of migration. First, in scenarios in which the nature of immigration/emigration changes significantly the cultural-demographic composition of a nation (see *The Spanish Case*, below), attitudes toward evolution and acceptance of evolution could be influenced by the migration process. As we discuss in the next section, Spain could experience, by 2050, a drop in public acceptance of evolution (currently at 53% as "God-guided human evolution" and +70% as agreement with the statement "evolution is true;" rates consistent with Spain's GDP; Figs. 1.1 and 1.3, Chapter One) associated with an influx of highly religious immigrants and emigration of less religious, or non-religious, fractions of its population. Second, in cases, like the U.S., where the in-house public acceptance of evolution is very low for its GDP (28% as "God-guided human evolution" and ≈40% as "evolution is true;" Figs. 1.1 and 1.3, Chapter One), immigration might actually contribute to increase—although slightly—the favorable views toward evolution (see *The American Case*, below). The U.S. is expected to change its immigrant

population structure during the next fifty years, from 47% Hispanic-, 26% Asian-, 18% European-, and 8% African-American in 2015, to 38% Asian-, 31% Hispanic-, 20% European- and 9% African-American by 2065 (Pew Research Center 2015c). Keep in mind that as integrated ethno-cultural communities, Asian- and Hispanic-Americans have comparable rates of acceptance of human evolution as per geographic origin (i.e. Asian- China 64%, Japan 60%; Hispanic-Americans 63%) to European-Americans (67%) and higher than African-Americans (55%; IPSOS 2011; Pew Research Center 2015d). In addition the U.S. is projected to increase its unaffiliated population by 2050 (data below), which acceptance of evolution is consistently high (currently, 82% of unaffiliated Americans agree that "humans evolved over time;" Pew Research Center 2015d). The key point to emphasize is that, in contrast to Spain (a nation in which the unaffiliated population will grow comparably to the U.S. by 2050), the U.S. trend to increase its unaffiliated population will not be surpassed—as in Spain— by the significant influx of highly religious immigrants (below). Third, in scenarios where immigration/emigration do not influence considerably the in-house cultural-demographic composition of a population, we shall expect minor, or no fluctuations in the public support to evolution associated with migration.

## **Demographics of Religious Groups**

In Chapter Two, we discussed the prediction of change in evolution's acceptance as function of religiosity (one of the three predictions of the Incompatibility Hypothesis). In it, we examined the broad assumption that atheists, non-believers and agnostics will accept evolution more (e.g. 93%, Paz-y-Miño-C and Espinosa 2012c, 2013a) than moderate or deeply religious individuals, or as function of moderate or fundamentalist religious denominations, as depicted in Fig. 2.5 (Chapter Two), from Buddhist (81%) to Jehovah's Witness (8%), and everything in between (i.e. Jewish 77%, Catholic 58%, Muslim 45%, Protestant 35%, Mormon 21%; The Pew Forum on Religion and Public Life 2008; Paz-y-Miño-C and Espinosa 2014a, 2015). We also associated this prediction—at a broader scale—with public acceptance of *human evolution*, which we documented it to be high among the least religious countries in the world (i.e. Sweden 68%, Germany 65%, China 64%, Belgium 61%, Japan 60%, France/Great Britain 55%) and low among the most religious (i.e. United States 28%, Russia 26%, Brazil 22%, Turkey 19%, Indonesia 11%, Saudi Arabia 7%; IPSOS 2011; Paz-y-Miño-C and Espinosa 2014a, b, 2015; see Fig. 1.1 in Chapter One). In this section, it is relevant to highlight that the

world religious landscape is projected to change, significantly, by the year 2050 and, obviously, onwards. The specifics of that change will vary from one country to another; in Box 9.2 we elaborate on two comparable, yet distinctive examples, Spain and the U.S.

The Pew Research Center (2015e) makes the following projections of religious groups' persistence by the year 2050, if the current trends continue. The world's religious profile will be driven, primarily, by differences in fertility rates, the proportion of youth among the religious populations, and by people switching religions. Although by 2050 Christians will continue to be the largest group (expected growth from 2.17 billion, in 2010, to 2.92 billion by 2050; Fig. 9.4a), Muslims will be growing faster than all major faiths (from 1.6 billion, in 2010, to 2.76 billion by 2050). Therefore, the global ratio of Christians and Muslims will change significantly, from 31.4% Christians and 23.2% Muslims, in 2010, to 31.4% Christians and 29.7% Muslims by 2050 (Fig. 9.4b; Pew Research Center 2015e).

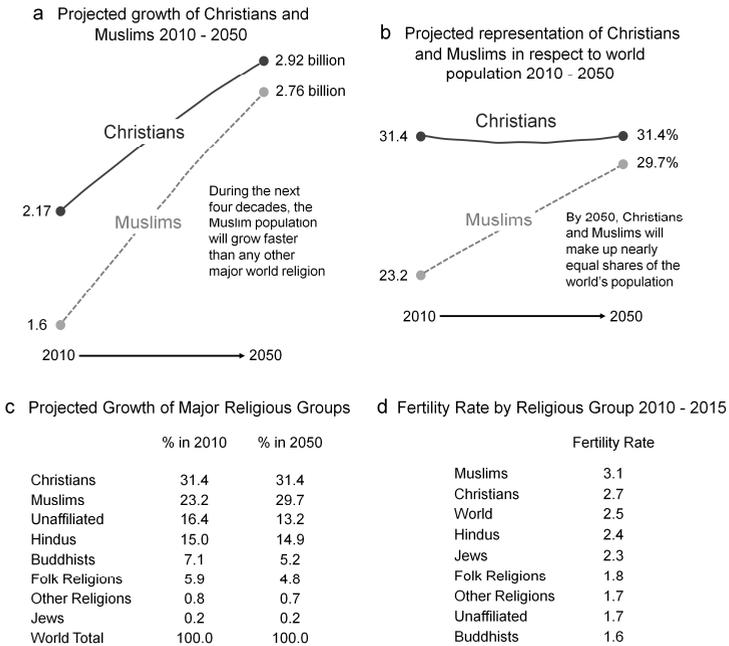


Fig. 9.4 Persistence of major religious groups projected to 2050 (redrawn and data adapted from Pew Research Center 2015e).

The unaffiliated (i.e. not associated with formalized religions, agnostics, non-believers or atheists) are expected to increase worldwide by 100 million during the next four decades (from 1.13 billion, in 2010, to 1.23 billion by 2050; Pew Research Center 2015e). However, their representation in the world population shall decrease (from 16.4%, in 2010, to 13.2% by 2050; Fig. 9.4c) due to the faster population growth rate among Christians and Muslims in respect to the unaffiliated (Pew Research Center 2015e). In fact, the world fertility rate of these groups is distinctive: 1.7 for the unaffiliated (among the lowest fertility rates of all) in contrast to 2.7 for Christians and 3.1 for Muslims (the highest fertility rates of all; Fig. 9.4d; Pew Research Center 2015e).

By 2050, Hindus will represent 14.9% (1.38 billion), Buddhist 5.2% (486 million), folk religions 4.8% (449 million), other religions 0.7% (61 million), and Jews 0.2% (16 million) of the total world population (Fig. 9.4c). In consequence, evolution's acceptance—or the phenomenon of the evolution controversy—will take place in a different global demographic and religious landscape than today's; with an evident shift toward a comparable representation of Christians (31.4%) and Muslims (29.7%) in the world population (Fig. 9.4b); the latter shall reach a grand total of 9.3 billion by 2050. However, Christians and Muslims will share identical representation in the world population by 2070 (32.3%), if current trends continue; and, by 2100, Muslims shall surpass Christians (34.9% vs. 33.8%, respectively; Pew Research Center 2015e).

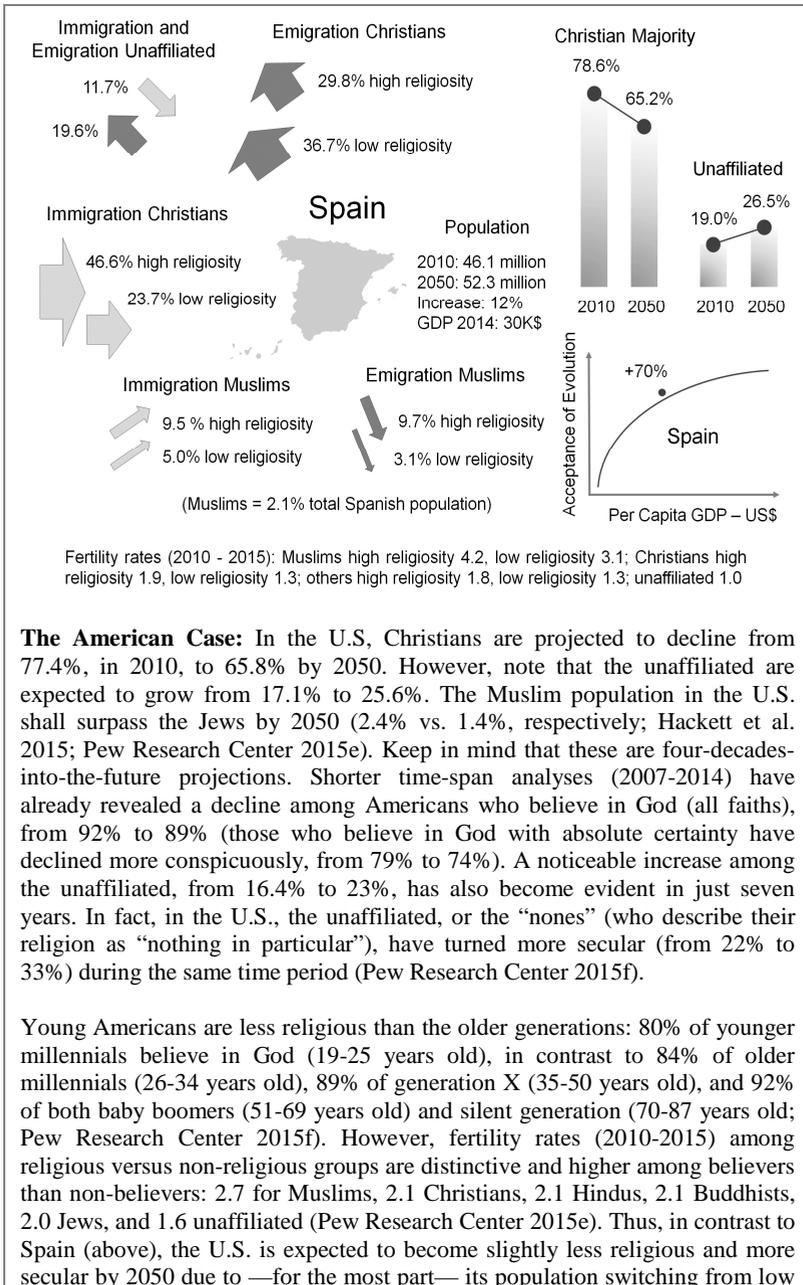
**Box 9.2.** Acceptance of Evolution in Future Spain vs. Future U.S.

**The Spanish Case:** Spain is an illustrative example, at the in-country level, of the global trends described in this Chapter. Keep in mind that, in this nation, public acceptance of evolution "conditionally" (i.e. God created humans) is 53% (Fig. 1.1, Chapter One; IPSOS 2011), and "thinking that evolution (excluding humans) is true" slightly surpasses 70% (Fig. 1.2, Chapter One; Miller et al. 2006). As discussed earlier, we can expect that differences in fertility rates, proportion of youth among the religious population, and people switching faiths will influence Spain's religious landscape, as follows: fertility rate by level of religiosity (projected 2010 to 2050) shall be 2.0 among the self-defined highly religious, 1.4 among the self-defined "low" religiosity group, and 1.0 among the unaffiliated (Stonawski et al. 2015). Currently (i.e. data from 2010), the 65+ year-old cohort is the most religious (66.4% high religiosity, 28.1% low religiosity, and 5.4% unaffiliated), which contrasts with the 35-64-year-old cohort (39.6% high religiosity, 41.2% low religiosity, and 19.2% unaffiliated), and with the 15-34-year-old cohort (30.2% high religiosity, 39.3%

low religiosity, and 30.6% unaffiliated; Stonawski et al. 2015). As per switching rates of religion and religiosity, 72% of male vs. 59% female Christians, and 57% of male vs. 63% female Muslims have changed their religious status, during their lifetimes, from highly religious to low (51% of male vs. 48% female Christians, and 39% of male vs. 47% female Muslims) or to unaffiliated (21% of males vs. 11% female Christians, and 18% of males vs. 16% female Muslims). Only Christians of low-level of religiosity have consistently switched to high rates of unaffiliated (up to 73% in males and 66% in females; Stonawski et al. 2015).

In addition, Spain's migration dynamics are likely to make the country more religious by 2050, and this is because its immigrants tend to be more religious than emigrants, as follows: Immigrants, 46.6% are self-defined highly religious Christians, and 23.7% are self-defined low-religiosity Christians. Among emigrants, 29.8% are self-defined highly religious Christians, and 36.7% are self-defined low-religiosity Christians. Immigration of the unaffiliated (11.7%) is surpassed by the emigration of this group (19.6%). Finally, immigration of Muslims (i.e. the largest non-Christian group) of high (9.5%) or low (5.0%) level of religiosity versus the emigration of Muslims of high (9.7%) or low (3.1%) level or religiosity is higher than their proportion (2.1%) in the total Spanish population (Stonawski et al. 2015). Although Christianity will continue to be the dominant religion in Spain, it is expected to drop from 78.6%, in 2010, to 65.2% by 2050. The unaffiliated will increase from 19.0% to 26.5% during the same time period (Pew Research Center 2015e). See data summary in image, below.

Because Spain is projected to become more religious than unaffiliated, we can speculate that acceptance of evolution in this nation shall decline during the next four decades as function of the transformation of its religious and demographic landscapes. Keep also in mind that acceptance of evolution among Catholics (58%) tends to be higher than among Muslims (45%; Fig. 2.5, Chapter Two; The Pew Forum on Religion and Public Life 2008). In this respect, the projected reduction in the representation of Christians, plus growth in the representation of Muslims, by 2050, shall also characterize the landscape of evolution's acceptance in future Spain.



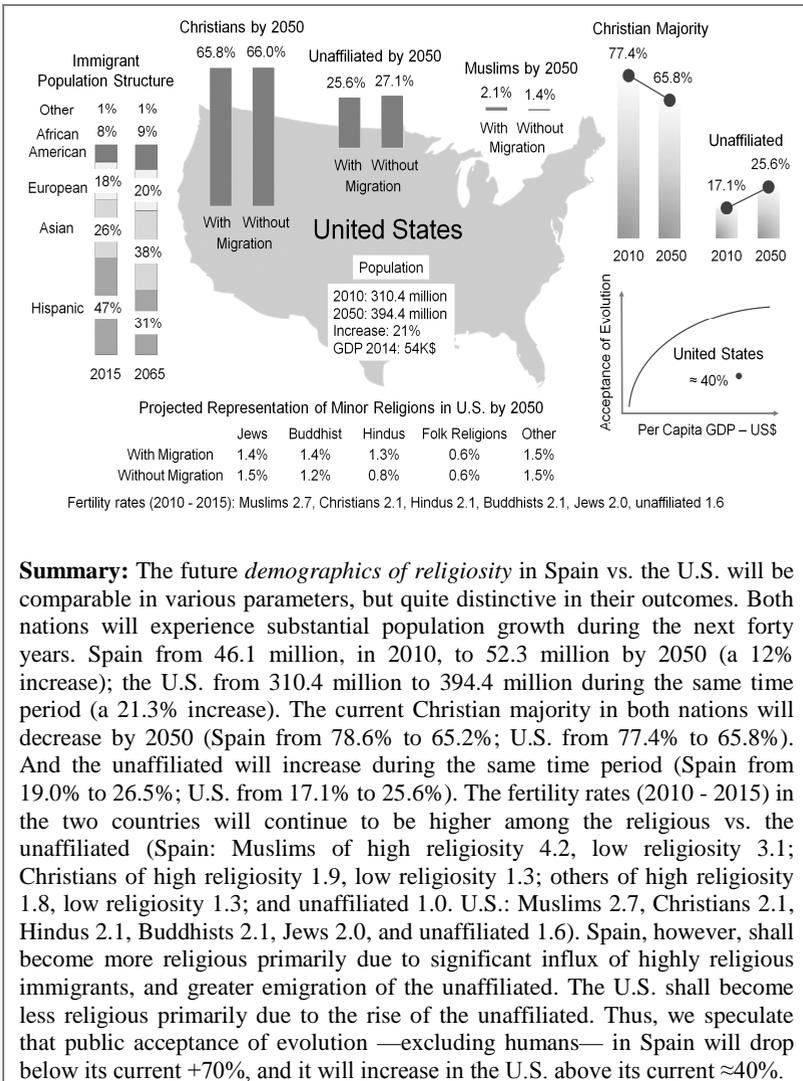
**The American Case:** In the U.S. Christians are projected to decline from 77.4%, in 2010, to 65.8% by 2050. However, note that the unaffiliated are expected to grow from 17.1% to 25.6%. The Muslim population in the U.S. shall surpass the Jews by 2050 (2.4% vs. 1.4%, respectively; Hackett et al. 2015; Pew Research Center 2015e). Keep in mind that these are four-decades-into-the-future projections. Shorter time-span analyses (2007-2014) have already revealed a decline among Americans who believe in God (all faiths), from 92% to 89% (those who believe in God with absolute certainty have declined more conspicuously, from 79% to 74%). A noticeable increase among the unaffiliated, from 16.4% to 23%, has also become evident in just seven years. In fact, in the U.S., the unaffiliated, or the “nones” (who describe their religion as “nothing in particular”), have turned more secular (from 22% to 33%) during the same time period (Pew Research Center 2015f).

Young Americans are less religious than the older generations: 80% of younger millennials believe in God (19-25 years old), in contrast to 84% of older millennials (26-34 years old), 89% of generation X (35-50 years old), and 92% of both baby boomers (51-69 years old) and silent generation (70-87 years old; Pew Research Center 2015f). However, fertility rates (2010-2015) among religious versus non-religious groups are distinctive and higher among believers than non-believers: 2.7 for Muslims, 2.1 Christians, 2.1 Hindus, 2.1 Buddhists, 2.0 Jews, and 1.6 unaffiliated (Pew Research Center 2015e). Thus, in contrast to Spain (above), the U.S. is expected to become slightly less religious and more secular by 2050 due to —for the most part— its population switching from low

religiosity to unaffiliated (Pew Research Center 2015f). The current migration trends in America are not expected to transform its religious landscape (but see Skirbekk et al. 2008), although noticeable changes will occur under two scenarios, *with* or *without* migration (i.e. immigration/emigration), as follows: Christians shall continue to be the majority with migration (65.8%) or without migration (66.0%), seconded by the unaffiliated (with migration 25.6% vs. without migration 27.1%), Muslims (2.4% vs. 1.4%), other religions (1.5% vs. 1.5%), Jews (1.4% vs. 1.5%), Buddhists (1.4% vs. 1.2%), Hindus (1.3% vs. 0.8%), and folk religions (0.6% vs. 0.6%; Pew Research Center 2015e).

Although, according to the Pew Research Center (2013b),  $\approx 60\%$  (net value) of Americans think that humans have evolved/changed over time (but see Fig. 1.1, Chapter One), there is much disagreement among *religious traditions* (different from "denominations," as in Fig. 2.5, Chapter Two) about how human evolution took place: 21% of Christians (range from 6% Jehovah's Witnesses to 31% Catholics) think that humans evolved due to natural processes, in contrast to 25% of Muslims, 58% of Jews, and 63% of unaffiliated (range from 53% among "nothing in particular" to 91% among atheists). Supreme-Being-guided human evolution is embraced by 29% of Christians (range from 15% Jehovah's Witnesses to 31% Catholics, historically black and mainline Christians), in contrast to 25% of Muslims, 18% of Jews, and 14% of unaffiliated (range from 2% of atheists to 19% among "nothing in particular"). And belief that humans have always existed in their present form (i.e. young earth creationism) is also distinctive among groups: 42% of Christians (range from 29% of Catholics to 74% Jehovah's Witnesses), 41% of Muslims, 16% of Jews, and 15% of unaffiliated (range from 3% agnostics to 20% among "nothing in particular;" Pew Research Center 2015f). See data summary in image, below.

Because the U.S. is projected to become slightly less religious and more unaffiliated by 2050 (primarily due to faith switching and secularization of the "nones," above; but see Skirbekk et al. 2008), we speculate that acceptance of evolution in this nation will increase during the next four decades. However, America's fascination with reinventing variants of creationism (e.g. theistic evolution, creation science, young earth creationism, Intelligent Design, BioLogos, evolutionary creation; see Box 1.2, Chapter One) to challenge evolution, or insert a Creator or Designer in the background of causality (distant creationism, Chapters One and Two), shall probably continue in the future, although in an improved, more-favorable-to-evolution landscape. A forecast that we make with cautious optimism.



**Summary:** The future *demographics of religiosity* in Spain vs. the U.S. will be comparable in various parameters, but quite distinctive in their outcomes. Both nations will experience substantial population growth during the next forty years. Spain from 46.1 million, in 2010, to 52.3 million by 2050 (a 12% increase); the U.S. from 310.4 million to 394.4 million during the same time period (a 21.3% increase). The current Christian majority in both nations will decrease by 2050 (Spain from 78.6% to 65.2%; U.S. from 77.4% to 65.8%). And the unaffiliated will increase during the same time period (Spain from 19.0% to 26.5%; U.S. from 17.1% to 25.6%). The fertility rates (2010 - 2015) in the two countries will continue to be higher among the religious vs. the unaffiliated (Spain: Muslims of high religiosity 4.2, low religiosity 3.1; Christians of high religiosity 1.9, low religiosity 1.3; others of high religiosity 1.8, low religiosity 1.3; and unaffiliated 1.0. U.S.: Muslims 2.7, Christians 2.1, Hindus 2.1, Buddhists 2.1, Jews 2.0, and unaffiliated 1.6). Spain, however, shall become more religious primarily due to significant influx of highly religious immigrants, and greater emigration of the unaffiliated. The U.S. shall become less religious primarily due to the rise of the unaffiliated. Thus, we speculate that public acceptance of evolution —excluding humans— in Spain will drop below its current +70%, and it will increase in the U.S. above its current ≈40%.

Finally, influential nations in world socio-economic and cultural affairs will also experience —like Spain and the U.S., Box 9.2— a significant reduction in current Christian majorities: the U.K. (from 64.3%, in 2010, to 45.4% by 2050), France (from 63% to 44.1%), Australia (from 67.3% to 40.7%), the Netherlands (from 50.6% to 49.1% unaffiliated), and New

Zealand (from 57% to 45.1% unaffiliated). In contrast, in Latin America, Christians will continue to be the largest religious majority (slight fluctuation from 90%, in 2010, to 89% by 2050); however, the unaffiliated will grow from 45 million (8% in 2010) to 65 million (9% by 2050; Pew Research Center 2015e). In consequence, we should expect a global change in the religious landscape, with regional and country-by-country specific transformations—in some cases, a lack of them—in which evolution's acceptance will take place.

### **Conclusion: Acceptance of Evolution as an Indicator of the Cultural Status of a Nation**

If people do not accept evolution, so what? Because acceptance of evolution correlates with wealth and prosperity of a nation (GDP), educational attainment (i.e. school life expectancy), leadership in science and technology (i.e. excellence in tertiary education), and low levels of belief in supernatural causation—quantifiable characteristics of today's most advanced societies—we hypothesize that a country's relative rate of public support to evolution might be an overall indicator of its cultural status. Examples include Iceland, Denmark, Sweden, France, Japan, U.K., Norway, Belgium, Spain and Germany (i.e. where public acceptance of evolution is close to 70% or higher; Figs. 1.2 and 1.3, Chapter One). Even in the U.S.—a hesitant supporter of evolution and highly religious outlier in respect to GDP—its combined populations of evolution sympathizers and unaffiliated surpass all other groups in support to: healthcare, contraception, vaccinations, environmental protection, clean energy, genetic- and bio-engineering (including genome editing to improve health), space explorations, government and private sector funding for basic science, investigations about the origin of the universe (Big Bang), as well as pro-choice legislation, same-sex marriage (including rights to adoption), and end of life with dignity (Pew Research Center 2015b, d, f, g, h). All indicators of cultural prosperity.

As discussed in Chapter Two, *belief* is a powerful cultural pollutant, it disrupts, distorts, delays or stops the acceptance of scientific evidence (i.e. the 3Ds + S cognitive effects of illusory thinking; Box 2.1). Belief in supernatural causation is *the* major *factor* preventing the general public—worldwide—from accepting the most significant discovery in the history of science, the fact of evolution.

In this Chapter, we have sketched how distribution of wealth, education, migration, and demographics of religious groups can influence the dynamic—and sometimes fragile—landscape(s) in which acceptance of evolution takes place at both the global and in-country scales (e.g. the Spain vs. U.S. comparison in Box 9.2). It seems like the predictions of the Incompatibility Hypothesis (i.e. historical, informational, and conflict-/conflict-resolution; Paz-y-Miño-C and Espinosa 2014b; Chapter Two) are consistent with the displacement prediction of the *secularization hypothesis* (Bruce 2002; Dobbelaere 2000; Martin 1978, 2012; Swatos and Christiano 1999; Stonawski et al. 2015; but see O'Brien and Noy 2015), which suggests that, over time, science and reason will replace religion and faith, or that modernization (i.e. human development) will lead to a decline in the belief in supernatural causality (i.e. abandonment of personal and collective unsubstantiated fears and anxieties). The secularization progression has been attributed, particularly, to the chronology of the "cultural West" (Northern and Western Europe; Bruce 2002), but due to the difficulty to document it ubiquitously (e.g. in Eastern Europe or elsewhere) it has been received with skepticism.

In our view, it appears that the objections to the secularization phenomenon reside, in part, on: (1) highlighting context-specific outliers, country-by-country (e.g. as per acceptance of evolution: U.S., Greece, Austria, Switzerland and Norway, Fig. 1.3; or as per level of religiosity: U.S. and Kuwait, Fig. 1.4; see also the context-specific argument for religious variation in Hout and Greeley 1987; Hout et al. 2001; Greeley 2002; Smith 2008), or (2) disregarding that generalized human development itself has not yet been achieved due to persistent global inequality (see long term projections, above), rather than (3) looking at, and overlapping, the broad statistical trends associated with inducing or constraining secularization: GDP, education indicators, global migrations, projections of population structure, and demographic mobility and settlement of religious groups.

At the same time, we acknowledge that the raw supply and demand of *belief* (= the disruptor), within the religious markets models (Stark and Iannacone 1994; Grim and Finke 2007), need to be taken into consideration when examining both the secularization and incompatibility hypotheses. However, the persistence of the commodity belief in the social market, does not necessarily invalidate the relevance of the secularization progression, and certainly does not resolve the intrinsic incompatibility between scientific rationalism/empiricism and faith (Paz-y-Miño-C and

Espinosa 2013a). In this respect, we caution that, in the case of evolution, the supply of disruptors includes the repackaging of para-creationist "alternatives" to the science of evolution (e.g. theistic evolution, creation science, young earth creationism, Intelligent Design, BioLogos, or evolutionary creation; Box 1.2, Chapter One). These fascinating research topics require further academic development and quantitative testing. They are essential in our quest to *measuring the evolution controversy*.

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