

4 A GENERAL DESCRIPTION OF THE PLEXUS OF DETERMINANTS GENERATING MAJOR INNOVATIONS

The source of major innovations (e.g., GPTs) depends on complex drivers over time and space. Economic literature shows several determinants of major technologies (cf. Ruttan, 1997, 2006; Bresnahan and Trajtenberg, 1995; Coccia, 2010; 2014; 2014a; 2015; Schultz and Joutz, 2010). Some main driving forces of GPTs are discussed as follows.

Geographical factors: temperate climate and natural resources

Technological innovation is a vital human activity that interacts with geographic factors and natural environment (Coccia, 2015a). Geographical characteristics of certain areas support the location of people and, as a consequence, the concentration of productive activities, inventions and technological innovations over the long run (Krugman, 1991). The new geography of innovation analyses several spatial factors relating to the origin and diffusion of technological innovation, e.g., spatial proximity of economic subjects and agglomeration of resources (Rosenberg Norman, 1992; Smithers and Blay-Palmer, 2001; Howells and Bessant, 2012). In particular, new economic geography argues that “all production depends on and is grounded in the natural environment” (Hudson, 2001, p.300). Feldman and Kogler (2010) claim that the natural advantages of resource endowments and climate in certain places can induce innovation and economic growth (cf., Moseley et al., 2014). Lichtenberg (1960) shows that geo-graphical factors, rather than proximity to raw materials or markets, influence the production of knowledge and the cumulative nature of several innovations. Audretsch and Feldman (1996) confirm that the agglomeration of firms and innovative activities is related to advantages in the natural environment, such as available resources and other factors of the physical geography. In general, the concentration of human and natural resources is in specific ge-ographical places, such as major cities, long known to be society’s predominant engines of innovation and growth (Betten-court et al., 2007). The climate is a main geographical factor that affects natural resources, natural environment and human activities. Long ago, Montes-quieu (1947 [1748]) argued that the climate shapes human attitude, culture and knowledge in society. Recent economic literature shows that warm temperate climates have an appropriate natural environment for humans that, by an evolutionary process of adaptation and learning, create complex societies, efficient institutions and communications systems. This socio-economic platform supports, in temperate latitude, the efficient use of human capital and as-sets that induce inventions, innovations and their diffusion over time and space (Coccia, 2015a).

Cultural and religious factors

Barro and McCleary (2003, p. 760) argue that: “successful explanations of economic performance must go beyond narrow measures of economic variables to encompass political and social forces”. In fact, modern literature is also analysing social forces of economic development such as the culture (e.g. Guiso et al., 2006, pp. 23ff; Maridal, 2013; for factors of socio-economic systems cf. Coccia, 2009d; 2013). Weber (1956) discussed how the Protestant religious culture has affected the economic attitude of people and the entrepreneurship of capitalistic systems. Current socio-economic research analyses the religion and culture as basic drivers of economic growth and innovation (cf. Barro and McCleary, 2003; 2005; Guiso et al., 2006; Spolaore and Wacziarg, 2013; Coccia, 2014). Guiso et al. (2003) show the interplay between intensity of religious beliefs and people’s attitudes that are conducive to economic growth (e.g., cooperation, trust, thriftiness, government, institutions, women’s propensity to work, legal rules, and fairness of the market). In particular, Guiso et al. (2003, p. 225): “find that on average, religious beliefs are . . . conducive to higher per capita income and growth . . . Christian religions are more positively associated with attitudes conducive to economic growth” (cf. Bettendorf and Dijkgraaf, 2010). In fact, religion shapes people’s attitude of mind, education, culture and institutions of countries and likely is also a main socio-cultural determinant of the patterns of technological innovation (Coccia, 2014). A study displays that, on average, societies with a predominance of the Protestant, Jewish and Eastern religions have technological perfor-