Turkish Economic Review
www.kspjournals.org
Volume 5 March 2018 Issue 1

# Violent Crime driven by income inequality between countries

*By* Mario COCCIA [†]

**Abstract.** The literature has suggested several approaches to explain violent crime, such as the heat hypothesis that more violence is associated to very hot temperature. However, the manifold determinants of violent crime in society are hardly known. This study shows that, controlling the climate, the intentional homicides (per 100,000 people) can be explained by the high level of income inequality, both in hot tropical areas and in temperate regions of the globe. Overall, then, the socioeconomic inequality is one of factors that generates aversive social environments and, as a consequence, a deteriorated human behavior leading to high rates of intentional homicides in society.
**Keywords.** Temperature, Inequality, Violent crime, Intentional homicides, Heat hypothesis.
**JEL.** D63, I14, I24, N30, O44, O57.

## 1. Introduction

One of the scientific problems of violent crime in social psychology is centered around a main issue: *what* environmental factors cause violent crime and aggressive behavior in society? This paper has two goals. The first is to show that hot temperatures, *per se,* provide a partial explanation of deteriorated human functioning leading to violent crime in society. The second is to stress the importance of the income inequality that negatively affect the mental health and to provide evidence that the high rates of violent crime at country level can be explained by high economic inequality in society, controlling the factor climate (Coccia, 2017e). This study is important in psychological sciences because The United Nations General Assembly in 2015 adopted the 2030 Agenda for Sustainable Development, addressing the need for violence prevention at an unprecedented scale (United Nations, 2015). In fact, determinants of the environmental violence have become more and more a critical argument in several scientific fields that consider different factors, such as poverty (Hsieh & Pugh, 1993; Lee, 2016), resource scarcity (Cozens, 2008), high population (Christens & Speer, 2005), social factors (Perkins *et al.,* 1993), characteristics of the inhabitants (Jencks, 1992), psychological factors (Kuo & Sullivan, 2001; Perkins *et al.,* 1993; Anderson, 1987), etc. A main research stream in social psychology is based on heat hypothesis: hot temperature can increase aggressive behavior and violence in society (Baron & Bell, 1976; Carlsmith *et al.,* 1979; Anderson, 1989; Anderson & Anderson, 1996). In particular, some scholars argue that hot climate can directly increase feelings of hostility and indirectly increase aggressive thoughts inter- and intra-groups (Anderson, 2001), but Simister & Cooper (2005, pp.7-8, original emphasis) discuss about some cities in Puerto Rico (with hot climate), which appear to be 'outliers' in having low crime rates relative to some U.S. cities (*cf. also* Simister & Van de Vliert, 2005). In general, this heat hypothesis has influenced several research fields of the psychological sciences, neuroscience, behavioral and cognitive sciences of crime (Baron, 1972; Anderson, 1987;

[*†] Arizona State University, Interdisciplinary Science and Technology Building 1 (ISBT1) 550 E. Orange Street, Tempe- AZ 85287-4804 USA.
. + 85287-4804
. mario.coccia@cnr.it

Anderson *et al.,* 1997; DeFronzo, 1984; Simister & Van de Vliert, 2005; Van de Vliert & Smith, 2004). Recently, Van Lange *et al.,* (2016) propose a model that seeks to understand the variation in aggression and violence in terms of differences in climate. These scholars show that lower average temperature and larger variation in seasonal temperature influence individuals and groups to adopt a slower life strategy and a stronger focus on self-control (Van Lange *et al.,* 2016). However, current theoretical frameworks about environmental violence are not comprehensive approaches because it is clear that there are at least some factors about aggressive behavior and violent crime in society that these studies have trouble explaining. In social psychology, several researchers have implicitly assumed that the hot climate is a *prime factor* of the violence and aggressive behavior. This study here challenges this conventional wisdom by highlighting the critical role of socioeconomic factors on human behavior that can lead to violent crime in society. Although "social psychologists are characteristically less critical of theories than is desirable" (Greenwald & Ronis, 1981, p.136), it would seem useful to explore other environmental factors and related interactions, from socioeconomic studies, that can support and integrate the approaches of social psychology in explaining the high rates of violent crime and aggressive behavior in areas both with hot and with temperate climate. Hence, this study here challenges by arguing that the high socioeconomic inequality, controlling the latitude (a proxy of the climate), can generate aversive environments for human behavior and violent crime in society as a result. The hypothesis of the study here will be substantiated with statistical analysis to develop an integrative theoretical framework to current psychological approaches that can clarify and explain, whenever possible a main relation relationship between human behavior and environmental violence. In order to position the analysis here within the existing literature, this paper begins by reviewing some studies and by discussing the theoretical framework of this study.

## 2. Theoretical framework and working hypothesis

Understanding *where* violent crime happens can provide vital information to explaining *why* it happens (Christens & Speer, 2005; Lee, 2016). It has been discussed in literature that environmental stressors, emanate from less than favourable conditions in built or natural locations, generate various psychological health problems in society (Lepore *et al.,* 1991). Some studies show that the crowding of specific areas has a significant negative influence on social relations and generates a deteriorated human functioning conducive to aggressive behavior (Altman, 1975; Baum & Paulus, 1991). Many studies, as said above, have showed that hot temperature seems to induce environmental violence (Simister & Van de Vliert, 2005). The theoretical framework of these studies is based on the heat hypothesis: hot temperatures can increase (under some conditions) aggressive behavior of humans. In this research field, Anderson & Anderson (1996, p. 748) predict that warmer cities will be positively associated with more violent behavior. Van de Vliert *et al.,* (1999, p.51) claim that: "the highest rates of violence are associated with temperatures about 24°C; whereas Simister & Cooper (2005) consider violence to be more common if temperatures are more than 24°C". Van de Vliert *et al.,* (1999) endeavour to explain the results with a relation between climate, culture and human behavior. Anderson (2001) confirmed that higher rates of aggression are in hot climate rather than cooler one. Simister & Van de Vliert (2005) argue that other factors of the climate (in addition to the temperature) are also relevant to environmental violence, such as rainfall and humidity. Specific studies, for explaining the high rates of violent crime, focus on 'cultural masculinity' of geoeconomic areas (Van de Vliert *et al.,* 1999). Instead, Simister & Cooper (2005, p.52) suggest a biological explanation of the heat hypothesis by considering the adrenaline of the body ("which is secreted into the blood at high temperatures, as part of a thermal control mechanism in humans", cf. also Duke *et al.,* 2013). Instead, other studies argue that hot weather negatively affects physical factors of geographical areas that reduce economic resources and, as a

consequence, increase the poverty and violence (e.g., farm output may be reduced by extreme weather, *cf.*, Van de Vliert *et al.,* 2000). Lower levels of democratization of countries can also be another factor related to high rates of violence and crime in society (Simister & Cooper, 2005).

The debate in these topics also concerns the temperature-aggression relationship (Anderson *et al.,* 2000). The literature shows that the relationship between temperature and violence can be linear or a curve with a Negative Affect Escape (called NAE; *cf.,* Bell, 1992; 2005; Anderson, 1989; Anderson & DeNeve, 1992; Anderson *et al.,* 2000; Rotton & Cohn, 2002; Rotton, 1986; 1993). Baron & Ransberger (1978) indicated that the frequency of collective violence and ambient temperature were curvilinearly related. Instead, Bushman *et al.,* (2005), using Minneapolis data, suggest a rectilinear rather than a curvilinear relationship. Although some studies seem to support the curvilinear relationship (cf., Rotton & Cohn, 2000a; Van de Vliert *et al.,* 1999), Anderson and colleagues have claimed that these results are methodologically weak (cf., Anderson, 1989; Anderson *et al.,* 2000). Rotton & Cohn (2004) argued that the curvilinear relationship holds only when escape to cooler temperatures is not readily available, but identifying other such circumstances and their practical and theoretical implications would be a valuable direction for the analysis of the heat–aggression relationship (*cf.,* Bell, 2005, p.72).

In social studies, the inequality is a vital factor to explain some dynamics in society because negatively influences wellbeing and economic growth (Aaberge & Mogstad, 2011; Herzer & Vollmer, 2012; Elbers *et al.,* 2008; *cf. also* Ferreira *et al.,* 2016). Fajnzylber *et al.,* (2002, 1-7) argue that: "Crime rates and inequality are positively correlated within countries and, particularly, between countries, and this correlation reflects causation from inequality to crime rates, even after controlling for other crime determinants. …an increase in income inequality has a significant and robust effect of raising crime rates". Hsieh & Pugh (1993) claim that poverty and income inequality are associated with violent crime. Ouimet (2012) also argues that economic development, inequality and poverty are significant predictors of the homicide rate for all countries. Blau & Blau (1982) argue that economic inequality is at the root of violent crime in the United States and Poveda (2011) finds that inequality has positive impacts on the homicide rates in seven major cities in Colombia. In general, there is a growing consensus that problematic socioeconomic conditions, such as unemployment, income inequality and poverty, are underlying causes of violent crime and homicide. Social studies have two competing theories for explaining the mechanisms through which inequality may foster environmental violence (Coccia, 2017e). The first theoretical framework is by Becker (1968). The crime is a function of an individual's calculations in weighing the expected utility of crime against the utility of using the same time and resources to pursue legal activities. This theory suggests that inequality leads to crime by placing low-income individuals who have low returns from market activity in proximity to high-income individuals who have things that are worth taking (Kelly, 2000). In particular, although poverty remains fixed, a larger income gap between the poor and the rich people would lead to rising criminal behavior because the expected gains of criminal activity are related to the wealth and assets of the potential targets (Enamorado *et al.,* 2016, p.130). The second approach is based on sociological theories of crime by Elgar (1938), who focuses on emotional feelings that lead people to become delinquents. According to this theory, individuals low in the social structure are frustrated by their failure to attain the material attributes of success, and this failure is more galling when they are confronted by the success of those around them (cf., Kelly, 2000). Poor people would be more likely to become violent in a place where inequality is high when compared with a similar individual living in a more egalitarian society (Fajnzylber *et al.,* 2002). In short, both theories strongly suggest that higher levels of inequality boost crime, even after controlling poverty levels.

In general, climate, scarce environmental resources and other socioeconomic factors can generate a "blockage of goal-seeking behavior" (Agnew, 1985, *passim*) and stimulate aggressive behavior and violence (Mackintosh *et al.,* 1975; Altman, 1975; Baldassare, 1975; Verbrugge & Taylor, 1980; Regoeczi, 2003; Schuurman & Horgan, 2016). In particular, inequality and poverty can produce deteriorated human functioning that leads to crime as a result (Christens & Speer, 2005; Coccia, 2017e). In other words, socioeconomic inequality, combined with high density of population, hot climate and other factors, may generate high levels of psychological stress in society (*e.g.,* frustration and anger) that most likely induce environmental violence (Regoeczi, 2003). However, although various studies about the relation between environmental stressors of human behavior and violence in society have been proposed, convincing and comprehensive arguments of the sources of violent crime in different geoeconomic areas are still hardly known. Specifically, the interaction between climate and income inequality has been largely ignored to explain the sources of frustration, anger and violent crime in society.

Theoretical frameworks just discussed above suggest a general relation between income inequality and violent crime across space and time that can lay the theoretical foundations to posit and explore the following working hypothesis.

Suppose that:

a) Countries of the Tropical zone have a warmer climate than countries of Temperate zone, *ceteris paribus*

b) Intentional homicides are an indicator of violent crime in society

c) Income inequality is a socioeconomic stressor both in rich and in poor countries

This study intends to substantiate the following focal hypothesis:

*Inequality Hypothesis*: Economic inequality negatively influences human functioning and leads to violent crime in society, *ceteris paribus* (i.e., controlling) the climate.

*Remark*: the hypothesis supposes that the income inequality, rather than hot temperature *per se*, is a stimulant of violent crime. Hence, the income inequality can be an invariant factor across time and space to explain the rate of violent crime in society, such as rates of intentional homicide.

The purpose of the present study is to see whether statistical evidence supports the hypothesis that the violent crime, measured with intentional homicides (per 100,000 people), can be explained by the high level of income inequality, measured with Gini coefficient, controlling the climate. Therefore, this study here has the goal of clarifying, as far as possible, the relation between socioeconomic inequality and high rates of violent crime in society, controlling (*ceteris paribus*) the climate factor of countries.

**Table 1.** *Variables, descriptions and sources of data*

| | |
|---|---|
| - Latitude<br>*Acronym*: LAT<br>*Source of data*: GeoNames, 2016; Mapszoom, 2016. | • Latitude is an important factor for determining climate of countries. |
| - GDP per capita PPP current Int. $ (2006)<br>*Acronym*: GDPPC2006y<br>*Source of data*: World Bank (2008); Norris (2015). | • Gross domestic product per capita (GDPPC) by purchasing power parity, 2006y. The gross domestic product (GDP) is the value of all goods and services produced minus the value of any goods or services used in their creation. |
| - Intentional homicides (per 100,000 people) 2006-2013<br>*Acronym*: HOM2006-13y<br>*Source of data*: World Development Indicators - The World Bank Group (2014). | • Intentional homicides (per 100,000 people) from UN Office on Drugs and Crime's International Homicide Statistics database. Intentional homicides are estimates of unlawful homicides purposely inflicted as a result of domestic disputes, interpersonal violence, violent conflicts over land resources, intergang violence over turf or control, and predatory violence and killing by armed groups. Intentional homicide does not include all intentional killing; the difference is usually in the organization of the killing. Individuals or small groups usually commit homicide, whereas killing in armed |

| | |
|---|---|
| | conflict is usually committed by fairly cohesive groups of up to several hundred members and is thus usually excluded. Period under study is 2006-2013. |
| - Income Gini coefficient 2004<br>*Acronym*: GINI2004y<br>*Source of data:* World Bank (2013); Norris (2015). | • Income Gini coefficient 2004y. Measure of the deviation of the distribution of income among individuals or households within a country from a perfectly equal distribution. A value of 0 represents absolute equality, a value of 100 absolute (social and economic) inequality. |
| - Population ages 0-14 (% of total 2003)<br>*Acronym*: POPY0-14<br>*Source of data:* World Bank (2004); Norris (2015). | • Population ages 0-14 (% of total 2003), this is an indicator of young in population. |

## 3. Methods

The method of condition-seeking of the study here has to purpose to analyse whether under the condition of high socioeconomic inequality, the violent crime increases, even after the climate of countries is controlled (*cf.* Greenwald *et al.,* 1986). This factor of socioeconomic inequality, within and between countries, can be considered a competitor variable to perform a "destructive testing" of the heat hypothesis (Anderson & Anderson, 1996).

The sample of this study focuses on 191 countries. The approach here is based on aggregate data at country level to calculate the arithmetic mean of variables over time and perform a cross-section analysis. The variables under study are in table 1.

Latitudes are a fairly good measure to detect, in average, the climate of countries (*cf.,* Anderson & Anderson, 1996, p. 744). In particular, this study divides the countries in two geographical zones.

*Tropics* are between 23.5S and 23.5N latitude (countries have average high temperatures).

Countries from 23.5N to 66.5N and between 23.5S and 66.5S are into the *temperate zones* with clear spring/summer/fall/winter seasons (*see*, world map of the Köppen-Geiger climate classification; Kottek *et al.,* 2006, p. 260*ff*).

The violent crime is measured with the Intentional homicides (per 100,000 people) at aggregated level (*i.e.,* country) to suggest inferences about the average violent crime rate across nations. This study does not consider other typologies of aggressive behavior such as rape, assault, etc. because they may be underreported and generate systematic bias in the analysis (*cf.*, Anderson & Anderson, 1996, p.744). The socioeconomic inequality of countries is measured by Income Gini coefficient (Measure of the deviation of the distribution of income among households within a country from a perfectly equal distribution). This variable can be a strong indicator of socioeconomic stress within countries (cf., Fajnzylber *et al.,* 2002). Gross Domestic Product (GDP) per capita by purchasing power parity is the most common indicator in socioeconomic studies to measure the economic activity and wealth of nations. GDP is the control variable in some statistical analyses performed here.

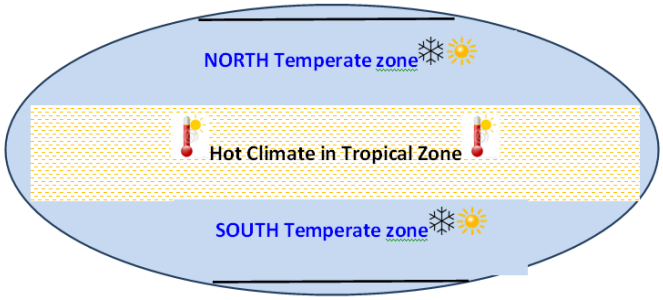


**Figure 1.** *Invariant relation between climate and socioeconomic inequality for explaining the source of violent crime*

The study here assumes that the climate (and related temperature) affects primarily the natural and economic environment of countries and it is this socioeconomic system that in turn influences people and their behavior, rather than to conjecture a linear cause-and-effect linkage from hot temperature to violent crime in society by-passing socioeconomic factors (in fact, between the temperature and human behavior there is the socioeconomic environment; Fig. 1-2). The idea of the study is to explain the high violent crime from a socioeconomic perspective, considering the level of income inequality as principal driver of environmental stress in society, in a comparable geoeconomic area with similar climate.

Figure 1 shows the visual representation of the theoretical interplay between climate and socioeconomic inequality that can lead to violent crime.

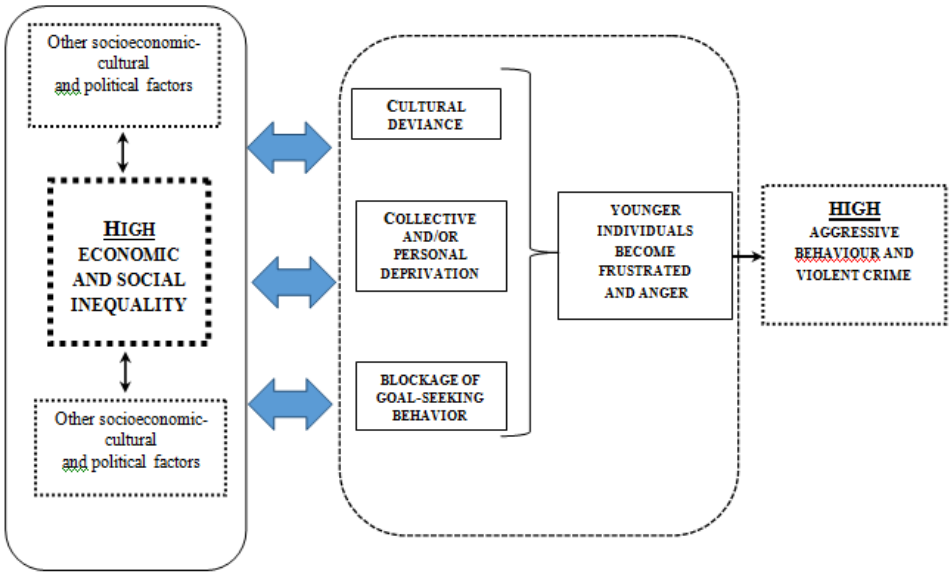


**Figure 2.** *Model from high economic and social inequality to environmental stressors that induce deteriorated human functioning and violent crime in society, ceteris paribus the climate.*

Evidence of hypothesis is based on following statistical analyses:

Descriptive statistics, bivariate correlation and partial correlation (with control variables Latitude and/or GDP per capita).

Independent Samples *T* Test (a parametric test) that compares the arithmetic means of Intentional homicides of two independent sets (*i.e.,* Countries *with* Gini coefficient higher/lowerthan arithmetic mean, both within and between Tropical and Temperate areas) in order to determine whether there is statistical evidence of significant difference.

In particular, the null hypothesis ($H_0$) and alternative hypothesis ($H_1$) of the independent samples *T* test are given by:

$$H_0: \mu_1 = \mu_2 \qquad H_1: \mu_1 \neq \mu_2$$

with:

$\mu_1$ = arithmetic mean of Intentional homicides (per 100,000 people) within countries with Gini coefficient *lower* than average value (in Tropical and Temperate zones).

$\mu_2$ = arithmetic mean of Intentional homicides (per 100,000 people) within countries with Gini coefficient *higher* than average value (in Tropical and Temperate zones).

Regression analysis with linear models of simple and multiple regression. The specification of the model of simple regression is:

$$Y_{i,t} = \lambda_0 + \lambda_1 x_{i,t} + u_{i,t} \qquad (\text{country } i=1, \ldots, n);\ t=\text{time}$$

where:
$Y_{i,t}$ (Dependent variable) = the Intentional homicides (per 100,000 people)
$x_{i,t}$= Gini coefficient of income inequality, which is the explanatory variable
$u_{i,t}$= Error term
The linear model of multiple regression is given by:

$$Y_{i,t} = \lambda_0 + \lambda_1 x_{i,t} + \lambda_2 k_{i,t} + \varepsilon_{i,t} \qquad (\text{country } i=1, \ldots, n),\ t=\text{time}$$

where:
$Y_{i,t}$ (Dependent variable) = the Intentional homicides (per 100,000 people)
$x_{i,t}$ = Gini coefficient of income inequality, which is the first explanatory variable
$k_{i,t}$= Latitude, which is the second explanatory variable
$\varepsilon_{i,t}$= Error term
The goodness of fit is measured with the coefficient of determination $R^2$. These models are estimated with the Ordinary Least Squares (OLS) method. The expectation of these statistical analyses is that, *fixed the latitude (climate of countries)*, high rates of intentional homicide are associated to countries with high income inequality: *i.e.,* the high rates of violent crime can be explained by high values of economic inequality, rather than hot temperature of certain geoeconomic areas *per se.* Statistical analyses are performed by using the Statistics Software SPSS® version 15.0.

## 4. Statistical evidence

This study endeavors to explain the violent crime by a socioeconomic cause that negatively affects the human functioning, even after the climate of countries is controlled. The evidence is presented with a general analysis considering all countries and a specific analysis of Tropical *vs.* Temperate climate countries.

### 4.1. General analysis of all countries

Table 1A in Appendix A shows descriptive statistics. In particular, the logarithmic transformation of variables shows normal distributions for appropriate statistical (parametric) analyses.

**Table 2.** *Bivariate correlation*

| | | LN GINI2004y | LN HOM2006-13y | LN GDPPC2006y |
|---|---|---|---|---|
| LN GINI2004y | Pearson Correlation | 1 | | |
| | Sig. (2-tailed) | | | |
| | N | 126 | | |
| LN HOM2006-13y | Pearson Correlation | 0.63** | 1 | |
| | Sig. (2-tailed) | 0.01 | | |
| | N | 124 | 183 | |
| LN GDPPC2006y | Pearson Correlation | -0.33** | -0.39** | 1 |
| | Sig. (2-tailed) | 0.01 | 0.01 | |
| | N | 126 | 183 | 191 |

**Note:** LN is logarithm; **= Correlation is significant at the 0.01 level (2-tailed). GINI2004y= Income Gini coefficient 2004; HOM2006-13y= Intentional homicides (per 100,000 people) 2006-2013; GDPPC2006y= GDP per capita PPP current Int. $ (2006).

Table 2 shows a very high coefficient of Pearson correlation (63%), which indicates a strong (positive) linear relationship between income inequality and Intentional homicides with 1% of statistical significance ($p$<0.01). This study also

found a negative linear relationship between Intentional homicides and GDP per capita ($r = -0.39$, $p<0.01$).

An important result is in table 3 with the partial correlation. This correlation indicates a strong (*positive*) relationship between income inequality and Intentional homicides, fixed the latitude and GDP per capita of countries ($r=0.503$, $p<0.001$). This result is consistent with the hypothesis stated above about the effect of rising socioeconomic inequality on high rates of violent crime, *ceteris paribus climate and income per capita* (GDP per capita PPP current Int. $).

**Table 3.** *Partial correlation*

| Control Variables | | | LN HOM 2006-13y | LN GINI 2004y |
|---|---|---|---|---|
| Latitude & LN GDPPC2006y | LN HOM 2006-13y | Correlation | 1 | |
| | | Significance (2-tailed) | . | |
| | | df | 0 | |
| | LN GINI 2004y | Correlation | 0.503 | 1 |
| | | Significance (2-tailed) | 0.001 | . |
| | | df | 120 | 0 |

**Note:** LN is logarithm; GINI2004y= Income Gini coefficient 2004; HOM2006-13y= Intentional homicides (per 100,000 people) 2006-2013; GDPPC2006y= GDP per capita PPP current Int. $ (2006).

**Table 4.** *Independent Samples Test with Intentional homicides (per 100,000 people) 2006-2013y period*

| | GINI coefficient 2004y | N | Mean*) | SD | Std. Error Mean |
|---|---|---|---|---|---|
| LN HOM 2006-13y | GINI 2004y≥ 40 | 54 | 2.18 | 1.06 | 0.14 |
| | GINI 2004y< 40 | 70 | 0.82 | 0.91 | 0.11 |

| Levene's Test for Equality of Variances | | | T-test for Equality of Means | | |
|---|---|---|---|---|---|
| | F | Sig. | t | df | Sig. (2-tailed) |
| Equal variances assumed | 0.09 | 0.76 | 7.72 | 122.0 | 0.001 |
| Equal variances not assumed | | | 7.57 | 104.9 | 0.001 |

**Note:** SD= Standard Deviation; GINI2004y= Income Gini coefficient 2004; *)= HOM2006-13y= Intentional homicides (per 100,000 people) 2006-2013.

Table 4 shows basic information (arithmetic mean and SD) of Intentional homicides (per 100,000 people) over 2006-2013 about countries with the income inequality (GINI 2004y) higher/lower than 40 (arithmetic mean). In general, countries with economic inequality higher than arithmetic mean (GINI 2004y =Gini coefficient ≥40) have also a high value of Intentional homicides (267.32% higher!) in comparison to countries with GINI 2004y<40 (cf., 1-2 row in tab. 4). Since the T-test for Equality of Means has $p<0.001$, we can reject the null hypothesis and conclude that the arithmetic mean of these two sets (i.e., income inequality higher/lower than arithmetic mean) is significantly different.

**Table 5.** *Regressions of Intentional homicides (per 100,000 people) equations*

| Dependent variable: LN Intentional homicides (per 100,000 people) average 2006-2013 | | | | | |
|---|---|---|---|---|---|
| | | *x* Gini coefficient of income inequality | *k* Latitude | | |
| *Models* | *Constant* $\lambda_0$ *(St. Err.)* | *Coefficient* $\lambda_1$ *(St. Err.)* | *Coefficient* $\lambda_2$ *(St. Err.)* | $R^2$ *(St. Err. of the Estimate)* | *F (Sign.)* |
| 1. *Explanatory variable* ○ Gini coefficient of income inequality 2004y | –9.43*** (1.22) | 2.97*** (0.33) | -- | 0.30 (0.93) | 79.56 (0.001) |
| 2. *Explanatory variables* ○ Gini coefficient of income inequality 2004y ○ Latitude | –9.43*** (1.76) | 2.96*** (0.46) | –0.00001805 (0.004) | 0.39 (0.93) | 39.45 (0.001) |

**Note:** ***=Coefficient is significant at $p<0.001$

OLS estimation of models of regression analysis is in table 5. These results indicate a reasonably $R^2$ of the estimated models 1 and 2 of 0.30 and 0.39 respectively, which implies that more than 30% of the variation in the Intentional homicides can be attributed (linearly) to Gini coefficient of income inequality. The coefficient of regression $\lambda_1$ of the model 2 indicates that a 1% higher income inequality, *ceteris paribus the latitude*, increases the expected Intentional homicides (per 100,000 people) by about 2.96% (*cf.,* geometric representation is in Fig. 3).

Figure 3 shows that countries with warm climate are in the North-East corner but these are also countries with a strong association between high socioeconomic inequality and violent crime. *Vice versa* the South-West corner has mainly countries with temperate climate, lower income inequality and violent crime.

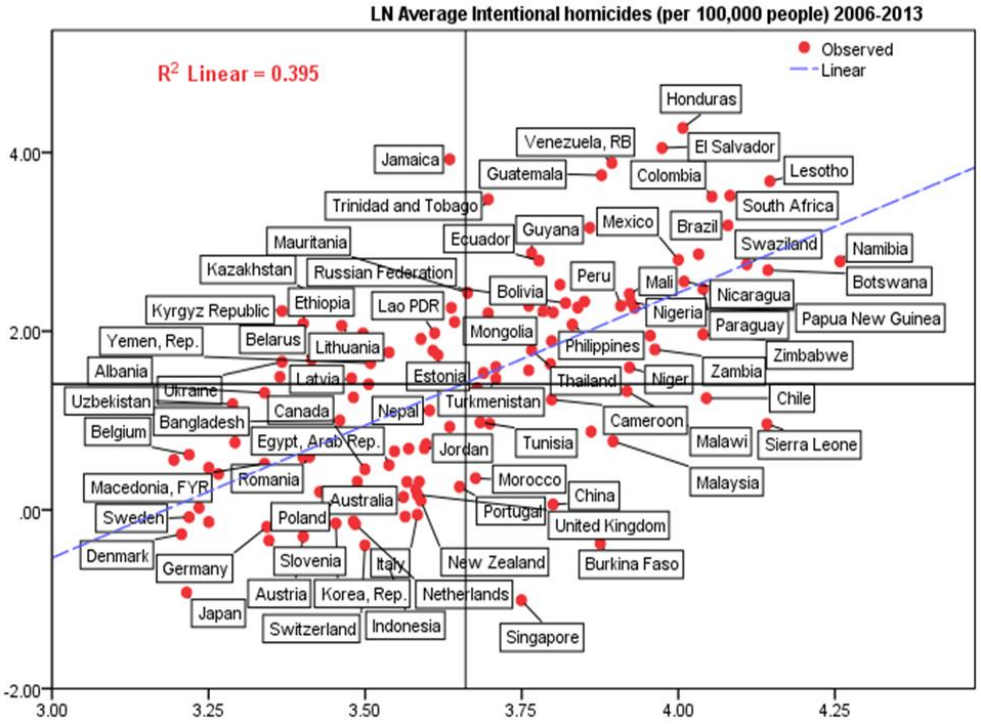


**Figure 3.** *Regression line of Intentional homicide on income Gini coefficient*

## 4.2. Statistical analyses of Tropical vs. Temperate climate countries

Table 2A in Appendix A shows descriptive statistics of variables understudy for Tropical and Temperate climate zone. Logarithmic transformation shows normal distribution of variables for applying correct statistical analyses (*cf. also* Appendix B). First of all, the Tropical Zone has higher average values of Intentional homicides (per 100,000 people) and of economic inequality.

Table 6 shows a high coefficient of correlation in Tropical zone between income inequality (GINI) and Intentional homicides (HOM). The Pearson correlation is 38% and indicates a good (*positive*) linear relationship between income inequality and Intentional homicides with statistical significance ($p$<0.01).

**Table 6.** *Bivariate correlation for Tropical and Temperate climate zone*

| *Tropical Zone (23°27'N-23°27'S)* | | LN GINI2004y | LN HOM2006-13y | LN GDPPC2006y |
|---|---|---|---|---|
| LN GINI2004y | Pearson Correlation | 1 | | |
| | Sig. (2-tailed) | | | |
| | N | 59 | | |
| LN HOM2006-13y | Pearson Correlation | 0.38** | 1 | |
| | Sig. (2-tailed) | 0.003 | | |
| | N | 57 | 98 | |
| LN GDPPC2006y | Pearson Correlation | 0.28* | 0.03 | 1 |
| | Sig. (2-tailed) | 0.03 | 0.78 | |
| | N | 59 | 98 | 103 |
| *Temperate climate Zone (>23°27'N and S)* | | LN GINI2004y | LN HOM2006-13y | LN GDPPC2006y |
| LN GINI2004y | Pearson Correlation | 1 | | |
| | Sig. (2-tailed) | | | |
| | N | 67 | | |
| LN HOM2006-13y | Pearson Correlation | 0.60** | 1 | |
| | Sig. (2-tailed) | 0.01 | | |
| | N | 67 | 85 | |
| LN GDPPC2006y | Pearson Correlation | –0.28* | –0.51** | 1 |
| | Sig. (2-tailed) | 0.02 | 0.01 | |
| | N | 67 | 85 | 86 |

**Note:** LN is logarithm; **= Correlation is significant at the 0.01 level; *= Correlation is significant at the 0.05 level (2-tailed); GINI2004y = Income Gini coefficient 2004; HOM2006-13y= Intentional homicides (per 100,000 people) 2006-2013; GDPPC2006y= GDP per capita PPP current Int. $ (2006).

The statistical analysis of this study also found a positive linear relationship between Intentional homicides and GDP per capita in Tropical zone ($r$=0.28, $p$<0.05). Temperate climate zone has a very high coefficient of correlation between income inequality and Intentional homicides: it is about 60% and indicates a strong (*positive*) linear relationship with 1 per cent of statistical significance ($p$<0.01). This study also found, in this temperate zone, a negative linear relationship between Intentional homicides and GDP per capita ($r$ = –0.28, $p$<0.05). This result can be explained with better institutions and high wellbeing of developed areas that decrease violent crime in comparison to countries of tropical area with poor institutional arrangements (cf., Acemoglu *et al.,* 2001). Partial correlation in table 7 also provides important results. This correlation indicates in Tropical zone a good (*positive*) relationship between income inequality and Intentional homicides, fixed the latitude and GDP per capita of countries ($r$=0.38, $p$<0.01). Temperate climate zone confirms this result with a higher coefficient of partial correlation ($r$=0.46, $p$<0.01).

**Table 7.** *Partial correlation for Tropical and Temperate climate zone*

| *Control Variables Latitude & LN GDPPC2006y* | | | LN HOM 2006-13y | LN GINI 2004y |
|---|---|---|---|---|
| Tropical Zone (23°27'N-23°27'S) | LN HOM 2006-13 | Correlation | 1 | |
| | | Significance (2-tailed) | . | |
| | | df | 0 | |
| | LN GINI 2004y | Correlation | 0.38 | 1 |
| | | Significance (2-tailed) | 0.004 | . |
| | | df | 53 | 0 |
| *Control Variables Latitude & LN GDPPC2006y* | | | LN HOM 2006-13y | LN GINI 2004y |
| Temperate climate Zone (>23°27' N and S) | LN HOM 2006-13 | Correlation | 1 | |
| | | Significance (2-tailed) | . | |
| | | df | 0 | |
| | LN GINI 2004y | Correlation | 0.46 | 1 |
| | | Significance (2-tailed) | 0.01 | . |
| | | df | 63 | 0 |

**Note:** LN is logarithm; GINI2004y = Income Gini coefficient 2004; HOM2006-13y= Intentional homicides (per 100,000 people) 2006-2013; GDPPC2006y= GDP per capita PPP current Int. $ (2006).

Table 8 shows that Tropical zone has a higher arithmetic mean of economic inequality measured with GINI coefficient 2004y (GINI 2004y=46 in Tropical

zone, whereas GINI 2004y=35 in Temperate climate zone). The hot zone of the globe confirms that the *subset* of countries with income inequality higher than arithmetic mean (*i.e.*, GINI 2004y≥46) has also a high value of Intentional homicides (per 100,000 people) over 2006-2013y (HOM 2006-13y is 2.39) in comparison to countries having economic inequality lower than mean GINI 2004y<46 (*i.e.,* HOM 2006-13y is 1.73). This regularity is confirmed in temperate climate areas (HOM 2006-13y is 1.22 in countries with economic inequality higher than mean, *i.e.,* GINI 2004y≥35, whereas average intentional homicide is 0.56 in the subset of countries with average economic inequality lower than arithmetic mean GINI 2004y<35, *see* table 8). Since the T-test for Equality of Means in table 8 has both in Tropical and in Temperate climate zone $p<0.05$, we can reject the null hypothesis and conclude that the arithmetic mean of these two subsets is significantly different at 5%. In general, countries of the *same* climate zone with high (average) income inequality have a high (average) value of Intentional homicides (per 100,000 people) over 2006-2013.

**Table 8.** *Independent Samples Test with Intentional homicides (per 100,000 people) 2006-2013 for Tropical and Temperate climate zone*

| *Tropical Zone (23°27'N-23°27'S)* | | | | | | |
|---|---|---|---|---|---|---|
| | GINI coefficient 2004y | | N | Mean* | Std. Dev. | Std. Error Mean |
| LN HOM 2006-13y | GINI 2004y≥ 46 | | 28 | 2.39 | 1.06 | 0.20 |
| | GINI 2004y< 46 | | 29 | 1.73 | 1.05 | 0.20 |
| | Levene's Test for Equality of Variances | | T-test for Equality of Means | | | |
| | F | Sig. | t | df | | Sig. (2-tailed) |
| Equal variances assumed | 0.005 | 0.94 | 2.35 | 55.00 | | 0.02 |
| Equal variances not assumed | | | 2.35 | 54.90 | | 0.02 |
| *Temperate climate Zone (>23°27'N and S)* | | | | | | |
| | GINI coefficient 2004y | | N | Mean* | Std. Dev. | Std. Error Mean |
| LN HOM 2006-13y | GINI 2004y≥ 35 | | 31 | 1.22 | 1.02 | 0.18 |
| | GINI 2004y< 35 | | 36 | 0.56 | 0.82 | 0.14 |
| | Levene's Test for Equality of Variances | | T-test for Equality of Means | | | |
| | F | Sig. | t | df | | Sig. (2-tailed) |
| Equal variances assumed | 2.206 | 0.14 | 2.96 | 65.00 | | 0.004 |
| Equal variances not assumed | | | 2.91 | 57.63 | | 0.005 |

**Note:** LN is logarithm; GINI2004y = Income Gini coefficient 2004; *= HOM2006-13y= Intentional homicides (per 100,000 people) 2006-2013.

OLS estimation for Tropical and Temperate climate zone produces the results in table 9 that shows positive coefficients of regression for linear models. In particular, Tropical zone with hot climate indicates that a 1% higher income inequality, *ceteris paribus latitude (proxy of climate and temperature)*, increases the expected violent crime measured with Intentional homicides (per 100,000 people) by about 2.5% (model 2)! Similar results for Temperate climate areas.

**Table 9.** Regressions of Intentional homicides (per 100,000 people) equations for Tropical and Temperate climate zone

| Dependent variable: LN Intentional homicides (per 100,000 people) average 2006-2013 | | | | | |
|---|---|---|---|---|---|
| *Explanatory variable* | | *x* Gini coefficient of income inequality | *k* Latitude | | |
| *Models for Tropical areas* (23°27'N-23°27'S) | *Constant* $\lambda_0$ *(St. Err.)* | *coefficient* $\lambda_1$ *(St. Err.)* | *coefficient* $\lambda_2$ *(St. Err.)* | $R^2$ *(St. Err. of the Estimate)* | *F* *(Sign.)* |
| 1. Gini coefficient of income inequality 2004y | –5.73* (2.55) | 2.05** (0.67) | -- | 0.13 (1.03) | 9.32 (0.003) |
| 2. Gini coefficient of income inequality 2004y; Latitude | –7.62** (2.66) | 2.52*** (0.69) | 0.02* (0.01) | 0.18 (0.99) | 6.96 (0.002) |

| *Models for Temperate climate areas* Zone(>23°27'N and S) | *Constant* $\lambda_0$ *(St. Err.)* | *coefficient* $\lambda_1$ *(St. Err.)* | *coefficient* $\lambda_2$ *(St. Err.)* | $R^2$ *(St. Err. of the Estimate)* | *F (Sign.)* |
|---|---|---|---|---|---|
| 1. Gini coefficient of income inequality 2004y | –8.39*** (1.52) | 2.617*** (0.43) | -- | 0.35 (0.78) | 37.01 (0.001) |
| 2. Gini coefficient of income inequality 2004y Latitude | –9.12*** (2.18) | 2.80*** (0.58) | 0.002 (0.005) | .35 (0.78) | 18.40 (0.001) |

**Note:** ***=Coefficient is significant at $p$<0. 001; **=Coefficient is significant at $p$<0.01; *=Coefficient is significant at $p$<0. 05.

Overall then, the statistical evidence shows the systematic differences of arithmetic mean of intentional homicides (per 100,000 people) between countries with high and low socioeconomic inequality, *fixed (i.e. controlling) the latitude (Climate factor)*. These results here seem in general to support the hypothesis stated that the high violent crime can be explained with the economic inequality, *controlling the climate of countries*, both in Tropical and in Temperate climate zone.

## 5. Discussion

The heat hypothesis in social psychology makes a clear prediction that warmer regions should have higher aggression rates (Anderson & Anderson, 1996, p.745). However, the study here shows that, controlling the climate factor, high violent crime at country level can be explained by high income inequality, which has high values in warmer geoeconomic areas. *Why income inequality is higher in countries with hot climate, e.g. Tropical zone?* One of contributing factors seems to be the historical developmental paths. Acemoglu *et al.,* (2001) argue that in regions where Europeans faced very high mortality rates, such as Tropical zones with hot temperature and Malaria, they could set up extractive states with the intention of transferring resources rapidly to the metropole. These institutions were detrimental to investment, rule of law and economic progress of these regions and persisted to the present (Acemoglu *et al.,* 2001, p.1395). These determinants of whether Europeans could go and settle in these regions with high mortality and hot temperature, therefore, have had negative effects on historical developmental paths of countries and their institutions today: current low economic growth, democratization, high poverty and socioeconomic inequality have created aversive environments that lead to high criminality in society (*cf.,* Ferreira *et al.,* 2016; Hsieh & Pugh, 1993; Fajnzylber *et al.,* 2002). This argument of detrimental institutions and rule of laws in countries with hot temperature, due to historical developmental paths, can also explain the question by Anderson & Anderson (1996) of *how* heat may have contributed to the development of a southern culture of violence. In short, the statistical analysis here seems to show that income inequality, *ceteris paribus* climate, can lead to aversive environments and violent crime as a result. *Mutatis mutandis,* the socioeconomic inequality can also explain the high crime rate within specific areas of cities with problematic socioeconomic factors (*cf.,* Cahill & Mulligan, 2003). This result is consistent with the socioeconomic literature that high rates of homicide tend to be positively and significantly associated to high levels of inequality in the distribution of income despite an extensive list of conceptually relevant controls (Messner & Rosenfeld, 1997; Lee & Bankston, 1999, Daly *et al.,* 2001; The Equality Trust, 2011). Elgar & Aitken (2010) also confirm that inequality is related to homicide independently of local context.

Now a question is: *why* and *how* economic inequality induces to high growth rates of intentional homicide despite controlling factors such as climate? We now move on to discuss and explain the relation between economic inequality, human

behavior and violence, trying, as far as possible, to clarify the problem just mentioned. Socioeconomic inequality tends to increase mainly in regions with a higher population density and a lower level of household income with subsequent increase of residential crime (cf., Cahill & Mulligan, 2003; Christens & Speer, 2005). This positive correlation between higher population density, income inequality and crime can be also explained with the association between high density of people and poverty (Curtis, 1975). In fact, high growth rates of population generate a high number of young population that, in the presence of poverty and high economic inequality, can be unable to achieve valuated goals. Data show that Population ages 0-14 (% of total) in 2003 was 37.6 in Tropical zones and 24.3 in Temperate climate zones. The "blockage of goal-seeking behavior" (Agnew, 1985, *passim*) of young people is a source of frustration and in certain environments that are aversive and painful may stimulate aggressive behavior and violence (Mackintosh *et al.,* 1975; Altman, 1975; Baldassare, 1975; Verbrugge & Taylor, 1980; Agnew, 1985). In other words, high density of population and the unbalanced growth of geoeconomic system in the space (Hirshman, 1969) generate income inequality that negatively influences social relations and leads to deteriorated human functioning and violence (Baum & Paulus, 1991; Regoeczi, 2003, p.457; *cf.*, Altman, 1975; Lepore *et al.,* 1991). The relationship between inequality and crime is also explained with sociological theories on crime, such as the theory of "relative deprivation": inequality breeds social tensions and the less well-off individuals feel dispossessed when compared with wealthier people (Stack, 1984). Hsieh & Pugh (1993) argue that poverty and income inequality are an indicator of resource deprivation, which is associated to homicide. Arthur (1991) also finds that the homicides can be explained with an individual's reaction to resource deprivation or material disadvantage that causes subsequent personal frustration and diffuse hostility (cf., Nettler, 1984, p.229). Stolzenberg *et al.,* (2006) confirm that sociological explanations of crime are based on economic deprivation that acts as a motivational factor in the manifestation of crime. In short, economic inequality engenders resentment, hostility, frustration, and is a precipitating factor in the impetus of criminal behavior (Blau & Blau, 1982). Messner & Golden (1992) extend the arguments by Blau & Schwartz (1984) with the thesis of the "'relative deprivation' …the consciousness of the disadvantaged, their realization of their common economic interests, and that the inability of the disadvantaged to get a fair redistribution of resources, or more open access to wealth, generates anger and frustration, which ultimately leads to more crime" (Stolzenberg *et al.,* 2006, p.304, original emphasis). This socio-psychological foundation of relative deprivation due to high income inequality "reduces one's ability to compete for scarce jobs by imposing standards of competition that those individuals cannot realistically be expected to meet, and, therefore, it is directly related to involvement in crime and violence as those individuals adapt to that reality in any way they can" (Kovandzic *et al.,* 1998, p.590). The feeling of disadvantage and unfairness leads the poor people to seek compensation and satisfaction by all means, including committing crimes against both poor and rich individuals (Fajnzylber *et al.,* 2002). In other words, economic inequality generates crime via psychosocial processes based on negative social interactions, human behavior and sense of control over one's life, combined with loneliness, tension, anxiety and depression (cf. Elgar & Aitken, 2010). According to Gillan (2001), the inequality affects personality of people generating disrespect, loss of face and humiliation which are amongst the most common triggers to violence. Daly *et al.* (2001) confirm that the distribution of wealth, rather than level of wealth, influences rates of murder and manslaughter. In addition, the relationship income inequality and violent crime in specific tropical and temperate zones can also generate a reverse causality because rising crime rates affect inequality by encouraging richer residents to move out of violent locations (Enamorado *et al.,* 2016). Hence, economic inequality and other socioeconomic

factors, even after the climate is controlled, increase the poverty and cultural deviance that generate high rates of violent crime (Regoeczi, 2003).

## 6. Concluding observations

On the basis of the argument presented in this paper, we can therefore conclude that one of the sources of violent crime across countries can be also explained by high levels of economic inequality, *ceteris paribus latitude (a proxy of climate and temperature)*. This socioeconomic factor could be a useful competitor variable for a destructive testing of the heat hypothesis to increase the likelihood of a theoretical links in social psychology between high economic inequality and crime rates across countries to explain aggressive behavior of humans. As a matter of fact, the hot climate can be an illusory cause of mental stress and deteriorated human functioning leading to violence, because the hot temperature may not be an environmental stressor *per se,* whereas a high socioeconomic inequality can lead to aversive environment, frustration, anger and violent crime in problematic geoeconomic areas, *ceteris paribus* the climate.

To sum up, the contributions of this study are that:

(1) The conceptual framework here assigns a central role to income inequality to explain deteriorated human functioning conducive to violent crime;

(2) The conceptual framework here is able to explain the source of high violent crime by high levels of income inequality both in Tropical and in Temperate climate areas. This socioeconomic stressor of inequality can be generalized, whenever possible, to explain the source of violence between and within countries and cities, controlling the climate factor;

(3) Societies with low socioeconomic inequality, high standard of living, quality of life and multiple opportunities for advancement of young generations are not likely to produce violent crime, *ceteris paribus* the climate.

(4) One future scenario might be that the increasing economic inequality within and between countries (World Bank, 2013) can feed high rates of violent crime for many years to come.

Programs of economic aid for one or more societies/cities/communities with high economic and social inequality would be appropriate policies to reduce this socioeconomic stressor and, as a consequence, the environmental violence. In fact, a political economy of growth directed to poor societies can increase economic prosperity to lower the economic inequality that set the stage for aversive environments and cultural deviance leading to violent crime over the long run. Fajnzylber *et al.,* (2002) also claim that the growth rate and distribution of income reduce the poverty, and the rate of poverty alleviation has a crime-reducing effect. Some scholars also argue that crime levels are expected to decline in the future because of investment in R&D and research labs, technology transfer, improved enforcement technologies and possible rising economic growth, but these expected results have to be considered together with other factors such as the possible increase of income inequality, population growth, public debt, recessions and economic turmoil, migration flows, global warming, etc.[1].

Overall, then, the deteriorated human functioning is due to manifold factors. This study seems to show that, controlling the climate, the income inequality is a *general* socioeconomic stressor for human behavior that can be conducive to frustrated and angry people, and violent crime as a result (Schuurman & Horgan, 2016; Agnew 1985; Christens & Speer, 2005; Anderson, 2001). However,

[1]Cf. also Calabrese *et al.,* 2005; Cariola & Coccia, 2004; Cavallo *et al.,* 2014, 2014a, 2015; Coccia, 2001, 2003, 2004, 2005, 2005a, 2005b, 2005c, 2006, 2006a, 2007, 2008, 2008a, 2008b, 2009, 2009a, 2010, 2010a, 2010b, 2010c, 2010d, 2010e, 2011, 2012, 2012a, 2012b, 2012c, 2012d, 2013, 2013a, 2014, 2014a, 2014b, 2014c, 2014d, 2014e, 2014f, 2014g, 2015, 2015a, 2015b, 2015c, 2015d, 2016, 2016a, 2016b, 2016c, 2017, 2017a, 2017b, 2017c, 2017d, 2018, Coccia & Bozeman, 2016; Coccia & Finardi, 2012, 2013; Coccia & Wang, 2015, 2016; Coccia & Cadario, 2014; Coccia *et al.,* 2015, 2012, Coccia & Rolfo, 2000, 2002, 2009, 2012, 2007, 2010, 2010, 2013; Coccia & Wang, 2015, 2016; Rolfo & Coccia, 2005.

conclusions of this study are tentative because we know that complex drivers of aggressive behavior in society are often not equal over time and space. The study here to analysis did not permit some intervening variables that may have been useful in providing a deeper and richer explanation of these phenomena of interests. Hence, much work remains if we are to understand in more depth the reasons for and the implications of environmental stressors of human behavior conducive to violent crime. To conclude, there is need for much more detailed research into the relations among geographical, socioeconomic and cultural factors and human behavior to explain the comprehensive drivers of cultural deviance and violence in society.

# Appendix A

**Table 1A.** *Descriptive statistics of all countries*

| | | Intentional homicides (per 100,000 people) Average 2006-2013y | LN Intentional homicides (per 100,000 people) Average 2006-2013y | GDP per capita PPP 2006y | LN GDP per capita PPP 2006y | GINI coefficient 2004y | LN GINI coefficient 2004y |
|---|---|---|---|---|---|---|---|
| N | Valid | 191 | 183 | 191 | 191 | 126 | 126 |
| | Missing | 0 | 8 | 0 | 0 | 65 | 65 |
| Mean | | 7.62 | 1.44 | $7455.72 | 7.82 | 40.14 | 3.66 |
| Std. Deviation | | 10.78 | 1.14 | $10780.67 | 1.60 | 10.36 | 0.25 |
| Skewness | | 3.12 | 0.10 | 1.86 | 0.06 | 0.63 | 0.16 |
| Kurtosis | | 11.42 | -0.49 | 2.81 | -0.97 | -0.27 | -0.75 |

**Table 2A.** *Descriptive statistics for Tropical and Temperate climate zone*

| Tropical Zone (23°27'N-23°27'S) | | Intentional homicides (per 100,000 people) Average 2006-2013y | LN Intentional homicides (per 100,000 people) Average 2006-2013y | GDP per capita PPP 2006y | LN GDP per capita PPP 2006y | GINI coefficient 2004y | LN GINI coefficient 2004y |
|---|---|---|---|---|---|---|---|
| N | Valid | 103 | 98 | 103 | 103 | 59 | 59 |
| | Missing | 0 | 5 | 0 | 0 | 44 | 44 |
| Mean | | 10.55 | 1.92 | $3343.19 | 7.13 | 45.78 | 3.80 |
| Std. Deviation | | 12.70 | 1.03 | $5729.89 | 1.41 | 9.26 | 0.21 |
| Skewness | | 2.65 | -0.34 | 3.18 | 0.29 | 0.27 | -0.20 |
| Kurtosis | | 7.71 | 0.69 | 10.61 | -0.72 | -0.22 | -0.45 |
| Temperate climate Zone (>23°27'N and S) | | | | | | | |
| N | Valid | 86 | 85 | 86 | 86 | 67 | 67 |
| | Missing | 0 | 1 | 0 | 0 | 19 | 19 |
| Mean | | 4.28 | 0.88 | $12091.27 | 8.62 | 35.17 | 3.53 |
| Std. Deviation | | 6.57 | 1.00 | $12888.62 | 1.42 | 8.63 | 0.22 |
| Skewness | | 3.61 | 0.71 | 1.08 | -0.27 | 1.47 | 0.79 |
| Kurtosis | | 14.62 | 0.14 | 0.27 | -0.99 | 2.43 | 0.66 |

# Appendix B. Box Plot of variables

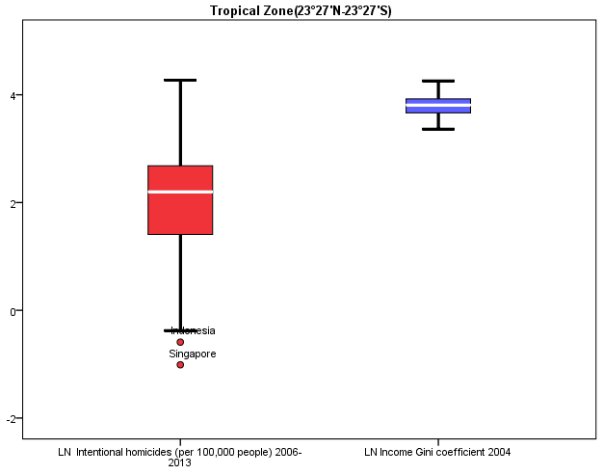


**Figure 1B.** *Box plot of intentional homicide and Gini coefficient in Tropical zone*

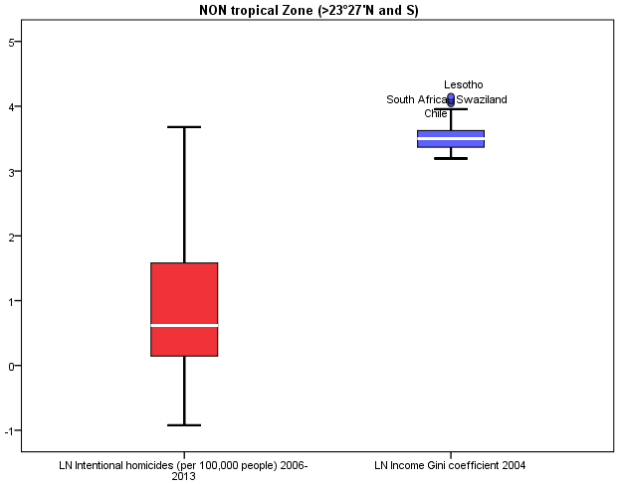


**Figure 2B.** *Box plot of intentional homicide and Gini coefficient in Temperate zone*

**Table 1B.** *Statistics*

| | | | Homicide Average 2006-13 | GINI coefficient (UNDP 2004) |
|---|---|---|---|---|
| Tropical Zone (23°27'N-23°27'S) | N | Valid | 103 | 59 |
| | | Missing | 0 | 44 |
| | Median | | 7.085 | 45.20 |
| | Range | | 71.85 | 42.00 |
| | Minimum | | 0.00 | 29.00 |
| | Maximum | | 71.85 | 71.00 |
| | Percentiles | 25 | 3.52 | 39.00 |
| | | 50 | 7.08 | 45.20 |
| | | 75 | 11.21 | 50.90 |
| NON tropical Zone (>23°27'N and S) | N | Valid | 86 | 67 |
| | | Missing | 0 | 19 |
| | Median | | 1.91 | 33.10 |
| | Range | | 39.56 | 3.01 |
| | Minimum | | 0.00 | 24.00 |
| | Maximum | | 39.56 | 63.00 |
| | Percentiles | 25 | 1.14 | 29.00 |
| | | 50 | 1.91 | 33.10 |
| | | 75 | 4.78 | 37.90 |

## References


Aaberge, R., & Mogstad, M. (2011). Robust inequality comparisons. *The Journal of Economic Inequality*, 9(3), 353-371. doi. 10.1007/s10888-010-9163-y

Acemoglu, D., Johnson, S., & Robinson J.A. (2001). The colonial origins of comparative development: An empirical investigation, *The American Economic Review*, 91(5), 1369-1401. doi. 10.1257/aer.91.5.1369

Agnew, R. (1985). A revised theory of delinquency, *Social Forces*, 64(1), 151-167. doi. 10.1093/sf/64.1.151

Altman, I. (1975). *The Environment and Social Behavior*. Brooks/Cole, Monterey, CA.

Anderson, C.A. (1987). Temperature and aggression: Effects on quarterly, yearly, and city rates of violent and nonviolent crime. *Journal of Personality and Social Psychology*, 52(6), 1161-1173. doi. 10.1037/0022-3514.52.6.1161

Anderson, C.A. (1989). Temperature and aggression: Ubiquitous effects of heat on occurrence of human violence. *Psychological Bulletin*, 106(1), 74–96. doi. 10.1016/S0065-2601(00)80004-0

Anderson, C.A. (2001). Heat and violence, current directions, *Psychological Science*, 10(1), 33-38. doi. 10.1111/1467-8721.00109

Anderson, C.A., & Anderson, K.B. (1996). Violent crime rate studies in philosophical context: A destructive testing approach to heat and southern culture of violence effects, *Journal of Personality and Social Psychology*, 70(4), 740-756. doi. 10.1037/0022-3514.70.4.740

Anderson, C.A., Anderson, K.B., Dorr, N., DeNeve, K.M., & Flanagan, M. (2000). Temperature and aggression. *In* M. Zanna (Ed.), *Advances in Experimental Social Psychology*, (pp.63–133). Academic Press, New York.

Anderson, C.A., Bushman, B.J., & Groom, R.W. (1997). Hot years and serious and deadly assault: Empirical tests of the heat hypothesis. *Journal of Personality and Social Psychology*, 73(6), 1213-1223.

Anderson, C.A., & DeNeve, K.M. (1992). Temperature, aggression, and the negative affect escape model. *Psychological Bulletin*, 111(2), 347-351. doi. 10.1037/0033-2909.111.2.347

Arthur, J.A. (1991). Socioeconomic predictors of crime in rural Georgia. *Criminal Justice Review*, 16, 29-41. doi. 10.1177/073401689101600106

Baldassare, M. (1975). The effects of density on social behavior and attitudes. *American Behavioral Scientist*, 18(6), 815–825. doi. 10.1177/000276427501800606

Baron, R.A. (1972). Aggression as a function of ambient temperature and prior anger arousal. *Journal of Personality and Social Psychology*, 21(2), 183-189. doi. 10.1037/h0032892

Baron, R.A., & Bell, P.A. (1976). Aggression and heat: The influence of ambient temperature, negative affect, and a cooling drink on physical aggression. *Journal of Personality and Social Psychology*, 33(3), 245–255.

Baron, R.A., & Ransberger, V.M. (1978). Ambient temperature and the occurrence of collective violence: The "long, hot summer" revisited, *Journal of Personality and Social Psychology*, 36(4), 351-360. doi. 10.1037/0022-3514.36.4.351

Baum, A., & Paulus, P.B. (1991). Crowding. *In* D. Stokols, & I. Altman (Eds.), *Handbook of Environmental Psychology*, Vol. 1, (pp. 533–570). Krieger, Malabar, FL.

Becker, G. (1968). Crime and punishment: an economic approach. Journal of Political Economy, 76, 169-217. doi. 10.1086/259394

Becker, G. (1995). The economics of crime. Cross sections Fall: 8–15. Federal Reserve Bank of Richmond, Richmond, VA.

Bell, P.A. (1992). In defense of the negative affect escape model of heat and aggression. *Psychological Bulletin*, 111(2), 342-346.

Bell, P.A. (2005). Reanalysis and perspective in the heat–aggression debate, *Journal of Personality and Social Psychology*, 89(1), 71–73. doi. 10.1037/0022-3514.89.1.71

Blau, P.M., & Schwartz, J.E. (1984). *Crosscutting Social Circles: Testing a Macrostructural Theory of Intergroup Relations*. Academic Press, Orlando, FL.

Blau, J.R., & Blau, P.M. (1982). The cost of inequality: Metropolitan structure and violent crime. *American Sociological Review*, 47, 45–62. doi. 10.2307/2095046

Blau, P.M. (1977). *Inequality and Heterogeneity*. New York: Free Press.

Bushman, B.J., Wang, M.C., & Anderson, C.A. (2005). Is the curve relating temperature to aggression linear or curvilinear? Assaults and temperature in Minneapolis reexamined. *Journal of Personality and Social Psychology*, 89(1), 62-66. doi. 10.1037/0022-3514.89.1.62

Cahill, M.E., & Mulligan, G.F. (2003). The determinants of crime in Tucson, Arizona. *Urban Geography*, 24(7), 582–610. doi. 10.2747/0272-3638.24.7.582

Calabrese, G., Coccia, M., & Rolfo, S. (2005). Strategy and market management of new product development: evidence from Italian SMEs, *International Journal of Product Development*, 2(1-2), 170-189. doi. 10.1504/IJPD.2005.006675

Cariola, M., & Coccia, M. (2004). Technology transfer virtual network: analysis within the National System of Innovation, *International Journal of Networking and Virtual Organisation*, 2(2), 162-172.

Carlsmith, J.M., & Anderson, C.A. (1979). Ambient temperature and the occurrence of collective violence: A new analysis. *Journal of Personality and Social Psychology*, 37(3), 337-344.

Carmeli, A., Gelbard, R., & Gefen, D. (2010). The importance of innovation leadership in cultivating strategic fit and enhancing firm performance, *The Leadership Quarterly*, 21(3), 339-349. doi. 10.1016/j.leaqua.2010.03.001

Cavallo, E., Ferrari, E., Bollani, L., & Coccia, M. (2014). Attitudes and behaviour of adopters of technological innovations in agricultural tractors: A case study in Italian agricultural system, *Agricultural Systems*, 130, 44-54. doi. 10.1016/j.agsy.2014.05.012

Cavallo, E., Ferrari, E., Bollani, L., & Coccia, M. (2014a). Strategic management implications for the adoption of technological innovations in agricultural tractor: the role of scale factors and environmental attitude, *Technology Analysis & Strategic Management*, 26(7), 765-779. doi. 10.1080/09537325.2014.890706

Cavallo, E., Ferrari, E., & Coccia, M. (2015). Likely technological trajectories in agricultural tractors by analysing innovative attitudes of farmers, *International Journal of Technology, Policy and Management*, 15(2), 158-177. doi. 10.1504/IJTPM.2015.069203

Christens, B., & Speer, P.W. (2005). Predicting violent crime using urban and suburban densities. *Behavior and Social Issues*, 14(2), 113–127.

Coccia, M. (2001). Satisfaction, work involvement and R&D performance. *International Journal of Human Resources Development and Management*, 1(2-3-4), 268-282. doi. 10.1504/IJHRDM.2001.001010

Coccia, M. (2003). Metrics of R&D performance and management of public research institute. *Proceedings of IEEE- IEMC 03*, Piscataway, pp.231-236.

Coccia, M. (2004). Spatial metrics of the technological transfer: analysis and strategic management. *Technology Analysis & Strategic Management*, 16(1), 31-52. doi. 10.1080/0953732032000175490

Coccia, M. (2005). Countrymetrics: valutazione della performance economica e tecnologica dei paesi e posizionamento dell'Italia, *Rivista Internazionale di Scienze Sociali*, CXIII(3), 377-412.

Coccia, M. (2005a). Metrics to measure the technology transfer absorption: analysis of the relationship between institutes and adopters in northern Italy. *International Journal of Technology Transfer and Commercialization*, 4(4), 462-486. doi. 10.1504/IJTTC.2005.006699

Coccia, M. (2005b). Technometrics: Origins, historical evolution and new direction, *Technological Forecasting & Social Change*, 72(8), 944-979. doi. 10.1016/j.techfore.2005.05.011

Coccia, M. (2005c). Economics of scientific research: origins, nature and structure, *Proceedings of Economic Society of Australia*.

Coccia, M. (2006). Classifications of innovations: survey and future directions. *Working Paper Ceris del Consiglio Nazionale delle Ricerche*, 8(2), 1-19. [Retrieved from].

Coccia, M. (2006a). Analysis and classification of public research institutes. *World Review of Science, Technology and Sustainable Developmen*t, 3(1), 1-16.

Coccia, M. (2007). A new taxonomy of country performance and risk based on economic and technological indicators, *Journal of Applied Economics,* 10(1), 29-42.

Coccia, M. (2008). Science, funding and economic growth: analysis and science policy implications. *World Review of Science, Technology and Sustainable Development*, 5(1), 1-27. doi. 10.1504/WRSTSD.2008.01781

Coccia, M. (2008a). Spatial mobility of knowledge transfer and absorptive capacity: analysis and measurement of the impact within the geoeconomic space. *The Journal of Technology Transfer*, 33(1), 105-122. doi. 10.1007/s10961-007-9032-4

Coccia, M. (2008b). New organizational behaviour of public research institutions: Lessons learned from Italian case study. *International Journal of Business Innovation and Research*, 2(4), 402–419. doi. 10.1504/IJBIR.2008.018589

Coccia, M. (2009). A new approach for measuring and analyzing patterns of regional economic growth: empirical analysis in Italy. *Italian Journal of Regional Science- Scienze Regionali*, 8(2), 71-95. doi. 10.3280/SCRE2009-002004

Coccia, M. (2009a). Measuring the impact of sustainable technological innovation, *International Journal of Technology Intelligence and Planning*, 5(3), 276-288. doi. 10.1504/IJTIP.2009.026749

Coccia, M. (2010). Public and private R&D investments as complementary inputs for productivity growth. *International Journal of Technology, Policy and Management*, 10(1/2), 73-91. doi. 10.1504/IJTPM.2010.032855

Coccia, M. (2010a). Foresight of technological determinants and primary energy resources of future economic long waves, *International Journal of Foresight and Innovation Policy,* 6(4), 225–232. doi. 10.1504/IJFIP.2010.037468

Coccia, M. (2010b). Energy metrics for driving competitiveness of countries: Energy weakness magnitude, GDP per barrel and barrels per capita. *Energy Policy*, 38(3), 1330-1339. doi. 10.1016/j.enpol.2009.11.011

Coccia, M. (2010c). Spatial patterns of technology transfer and measurement of its friction in the geo-economic space. *International Journal of Technology Transfer and Commercialisation*, 9(3), 255-267. doi. 10.1504/IJTTC.2010.030214

Coccia, M. (2010d). The asymmetric path of economic long waves, *Technological Forecasting & Social Change,* 77(5), 730-738. doi. 10.1016/j.techfore.2010.02.003

Coccia, M. (2010e). Democratization is the driving force for technological and economic change, *Technological Forecasting & Social Change*, 77(2), 248-264. doi. 10.1016/j.techfore.2009.06.007

Coccia, M. (2011). The interaction between public and private R&D expenditure and national productivity. *Prometheus-Critical Studies in Innovation*, 29(2), 121-130. doi. 10.1080/08109028.2011.601079

Coccia, M. (2012). Political economy of R&D to support the modern competitiveness of nations and determinants of economic optimization and inertia, *Technovation,* 32(6), 370–379. doi. 10.1016/j.technovation.2012.03.005

Coccia, M. (2012a). Evolutionary trajectories of the nanotechnology research across worldwide economic players. *Technology Analysis & Strategic Management*, 24(10), 1029-1050. doi. 10.1080/09537325.2012.705117

Coccia, M. (2012b). Evolutionary growth of knowledge in path-breaking targeted therapies for lung cancer: radical innovations and structure of the new technological paradigm. *International Journal of Behavioural and Healthcare Research*, 3(3-4), 273-290. doi. 10.1504/IJBHR.2012.051406

Coccia, M. (2012c). Converging genetics, genomics and nanotechnologies for groundbreaking pathways in biomedicine and nanomedicine. *International Journal of Healthcare Technology and Management*, 13(4), 184-197. doi. 10.1504/IJHTM.2012.050616

Coccia, M. (2012d). Driving forces of technological change in medicine: Radical innovations induced by side effects and their impact on society and healthcare. *Technology in Society*, 34(4), 271-283. doi. 10.1016/j.techsoc.2012.06.002

Coccia, M. (2013). What are the likely interactions among innovation, government debt, and employment? Innovation: *The European Journal of Social Science Research*, 26(4), 456–471. doi. 10.1080/13511610.2013.863704

Coccia, M. (2013a). The effect of country wealth on incidence of breast cancer. *Breast Cancer Research and Treatment*, 141(2), 225-229. doi. 10.1007/s10549-013-2683-y

Coccia, M. (2014). Path-breaking target therapies for lung cancer and a far-sighted health policy to support clinical and cost effectiveness. *Health Policy and Technology*, 1(3), 74-82. doi. 10.1016/j.hlpt.2013.09.007

Coccia, M. (2014a). Emerging technological trajectories of tissue engineering and the critical directions in cartilage regenerative medicine. *Int. J. Healthcare Technology and Management*, 14(3), 194-208. doi. 10.1504/IJHTM.2014.064247

Coccia, M. (2014b). Converging scientific fields and new technological paradigms as main drivers of the division of scientific labour in drug discovery process: the effects on strategic management of the R&D corporate change. *Technology Analysis & Strategic Management*, 26(7), 733-749, doi. 10.1080/09537325.2014.882501

Coccia, M. (2014c). Driving forces of technological change: The relation between population growth and technological innovation-Analysis of the optimal interaction across countries, *Technological Forecasting & Social Change,* 82(2), 52-65. doi. 10.1016/j.techfore.2013.06.001

Coccia, M. (2014). Socio-cultural origins of the patterns of technological innovation: What is the likely interaction among religious culture, religious plurality and innovation? Towards a theory of socio-cultural drivers of the patterns of technological innovation, *Technology in Society*, 36(1), 13-25. doi. 10.23760/2421-7158.2017.004

Coccia, M. (2014e). Religious culture, democratisation and patterns of technological innovation. *International Journal of Sustainable Society*, 6(4), 397-418. doi. 10.1504/IJSSOC.2014.066771

Coccia, M. (2014f). Structure and organisational behaviour of public research institutions under unstable growth of human resources, *Int. J. Services Technology and Management*, 20(4/5/6), 251–266. doi. 10.1504/IJSTM.2014.068857

Coccia, M. (2014g). Steel market and global trends of leading geo-economic players. International *Journal of Trade and Global Markets*, 7(1), 36-52, doi. 10.1504/IJTGM.2014.058714

Coccia, M. (2015). The Nexus between technological performances of countries and incidence of cancers in society. *Technology in Society*, 42, 61-70. doi. 10.1016/j.techsoc.2015.02.003

Coccia, M. (2015a). Patterns of innovative outputs across climate zones: the geography of innovation, *Prometheus. Critical Studies in Innovation*, 33(2), 165-186. doi. 10.1080/08109028.2015.1095979

Coccia, M. (2015b). General sources of general purpose technologies in complex societies: Theory of global leadership-driven innovation, warfare and human development, *Technology in Society*, 42, 199-226. doi. 10.1016/j.techsoc.2015.05.008

Coccia, M. (2015c). Spatial relation between geo-climate zones and technological outputs to explain the evolution of technology. *Int. J. Transitions and Innovation Systems*, 4(1-2), 5-21. doi. 10.1504/IJTIS.2015.074642

Coccia, M. (2015d). Technological paradigms and trajectories as determinants of the R&D corporate change in drug discovery industry. *International Journal Knowledge and Learning*, 10(1), 29-43. doi. 10.1504/IJKL.2015.071052

Coccia, M. (2016). Asymmetric paths of public debts and of general government deficits across countries within and outside the European monetary unification and economic policy of debt dissolution. *The Journal of Economic Asymmetries*, 15, 17-31. doi. 10.1016/j.jeca.2016.10.003

Coccia, M. (2016a). Radical innovations as drivers of breakthroughs: characteristics and properties of the management of technology leading to superior organizational performance in the discovery process of R&D labs. *Technology Analysis & Strategic Management*, 28(4), 381-395. doi. 10.1080/09537325.2015.1095287

Coccia, M. (2016). Problem-driven innovations in drug discovery: co-evolution of radical innovation with the evolution of problems, *Health Policy and Technology*, 5(2), 143-155. doi. 10.1016/j.hlpt.2016.02.003

Coccia, M. (2016c). The relation between price setting in markets and asymmetries of systems of measurement of goods. *The Journal of Economic Asymmetries*, 14(B), 168-178. doi. 10.1016/j.jeca.2016.06.001

Coccia, M. (2017). The source and nature of general purpose technologies for supporting next K-waves: Global leadership and the case study of the U.S. Navy's Mobile User Objective System, *Technological Forecasting and Social Change*, 116, 331-339. doi. 10.1016/j.techfore.2016.05.019

Coccia, M. (2017a). Optimization in R&D intensity and tax on corporate profits for supporting labor productivity of nations. *The Journal of Technology Transfer*, doi. 10.1007/s10961-017-9572-1

Coccia, M. (2017b). Varieties of capitalism's theory of innovation and a conceptual integration with leadership-oriented executives: the relation between typologies of executive, technological and socioeconomic performances. *Int. J. Public Sector Performance Management*, 3(2), 148–168. doi. 10.1504/IJPSPM.2017.084672

Coccia, M. (2017c). Sources of disruptive technologies for industrial change. *L'industria –rivista di Economia e Politicaindustriale*, 38(1), 97-120.

Coccia, M. (2017d). Sources of technological innovation: Radical and incremental innovation problem-driven to support competitive advantage of firms. *Technology Analysis & Strategic Management*, 29(9), 1048-1061. doi. 10.1080/09537325.2016.1268682

Coccia, M. (2017e). A Theory of general causes of violent crime: Homicides, income inequality and deficiencies of the heat hypothesis and of the model of CLASH, *Aggression and Violent Behavior*, 37, 190-200. doi. 10.1016/j.avb.2017.10.005

Coccia, M. (2017f). New directions in measurement of economic growth, development and under development, *Journal of Economics and Political Economy*, 4(4), 382-395.

Coccia, M. (2017g). Disruptive firms and industrial change, *Journal of Economic and Social Thought*, 4(4), 437-450.

Coccia, M. (2017h). The Fishbone diagram to identify, systematize and analyze the sources of general purpose Technologies, *Journal of Social and Administrative Sciences*, 4(4), 291-303.

Coccia, M. (2018). A theory of the general causes of long waves: War, general purpose technologies, and economic change. *Technological Forecasting & Social Change*, 128, 287-295 10.1016/j.techfore.2017.11.013

Coccia, M. (2018a). The relation between terrorism and high population growth, *Journal of Economics and Political Economy*, 5(1), 84-104.

Coccia, M. (2018b). Evolution of the economics of science in the twenty century, *Journal of Economics Library*, 5(1), 65-84.

Coccia, M. (2018d). The origins of the economics of innovation, *Journal of Economic and Social Thought*, 5(1), 9-28.

Coccia, M. (2018e). Theorem of not independence of any technological innovation, *Journal of Economics Bibliography*, 5(1), 29-35.

Coccia, M. (2018e). Theorem of not independence of any technological innovation, *Journal of Social and Administrative Sciences,* 5(1), 15-33.

Coccia, M., & Bozeman, B. (2016). Allometric models to measure and analyze the evolution of international research collaboration. *Scientometrics*, 108(3), 1065-1084. doi. 10.1007/s11192-016-2027-x

Coccia, M., & Cadario, E. (2014). Organisational (un)learning of public research labs in turbulent context, *International Journal of Innovation and Learning*, 15(2), 115-129. doi. 10.1504/IJIL.2014.059756

Coccia, M., Falavigna, G., & Manello, A. 2015. The impact of hybrid public and market-oriented financing mechanisms on scientific portfolio and performances of public research labs: a scientometric analysis. Scientometrics, 102(1), 151-168. doi. 10.1007/s11192-014-1427-z

Coccia, M., & Finardi, U. (2012). Emerging nanotechnological research for future pathway of biomedicine. *International Journal of Biomedical Nanoscience and Nanotechnology*, 2 (3-4), 299-317. doi. 10.1504/IJBNN.2012.051223

Coccia, M., & Finardi, U. (2013). New technological trajectories of non-thermal plasma technology in medicine. *International Journal of Biomedical Engineering and Technology*, 11(4), 337-356. doi. 10.1504/IJBET.2013.055665

Coccia, M., Finardi, U., & Margon, D. (2012). Current trends in nanotechnology research across worldwide geo-economic players, *The Journal of Technology Transfer*, 37(5), 777-787. doi. 10.1007/s10961-011-9219-6

Coccia, M., & Rolfo, S. (2000). Ricerca pubblica e trasferimento tecnologico: il caso della regione Piemonte. *In* S. Rolfo (ed), *Innovazione e piccole imprese in Piemonte*, Franco Angeli Editore, Milano.

Coccia, M., & Rolfo, S. (2002). Technology transfer analysis in the Italian national research council, Technovation - *The International Journal of Technological Innovation and Entrepreneurship*, 22(5), 291-299. doi. 10.1016/S0166-4972(01)00018-9

Coccia, M., & Rolfo, S. (2007). How research policy changes can affect the organization and productivity of public research institutes, *Journal of Comparative Policy Analysis, Research and Practice*, 9(3) 215-233. doi. 10.1080/13876980701494624

Coccia, M., & Rolfo, S. (2010). New entrepreneurial behaviour of public research organizations: opportunities and threats of technological services supply, *International Journal of Services Technology and Management*, 13(1-2), 134-151. doi. 10.1504/IJSTM.2010.029674

Coccia, M., & Rolfo, S. (2013). Human resource management and organizational behavior of public research institutions, *International Journal of Public Administration*, 36(4), 256-268. doi. 10.1080/01900692.2012.756889

Coccia, M., & Rolfo, S. (2009). Project management in public research organization: Strategic change in complex scenarios. *International Journal of Project Organisation and Management*, 1(3), 235–252. doi. 10.1504/IJPOM.2009.027537

Coccia, M., & Wang, L. (2015). Path-breaking directions of nanotechnology-based chemotherapy and molecular cancer therapy, *Technological Forecasting and Social Change,* 94, 155–169. doi. 10.1016/j.techfore.2014.09.007

Coccia, M., & Wang, L. (2016). Evolution and convergence of the patterns of international scientific collaboration. *Proceedings of the National Academy of Sciences of the United States of America*, 113(8), 2057-2061. doi. 10.1073/pnas.1510820113

Cozens, P.M. (2008). New urbanism, crime and the suburbs: A review of the evidence. *Urban Policy and Research*, 26(4), 1–16. doi.

Curtis, L.A. (1975). *Violence, Race, and Culture*. Health, Lexington, MA.

Daly, M., Wilson, M., & Vasdev, S. (2001). Income inequality and homicide rates in Canada and the United States. *Canadian Journal of Criminology*, 43, 219-236.

DeFronzo, J. (1984). Climate and crime-tests of an FBI assumption. *Environment and Behavior*, 16(2), 185-210. doi. 10.1177/0013916584162003

Duke, A.A., Bègue, L., Bell R., & Eisenlohr-Moul, T. (2013). Revisiting the serotonin–aggression relation in humans: A meta-analysis. *Psychological Bulletin*, 139(5), 1148-1172. doi. 10.1037/a0031544

Elbers, C., Lanjouw, P., Mistiaen, J.A., & Özler, B. (2008). Reinterpreting between-group inequality. *The Journal of Economic Inequality*, 6(3), 231–245. doi. 10.1007/s10888-007-9064-x

Elgar, F.J., & Aitken, N. (2011). Income inequality, trust and homicide in 33 countries. *The European Journal of Public Health*, 21(2), 241–246. doi. 10.1093/eurpub/ckq068

Enamorado, T., López-Calva, L.F., Rodríguez-Castelán, C., & Winkler, H. (2016). Income inequality and violent crime: Evidence from Mexico's drug war. *Journal of Development Economics*, 120, 128–143. doi. 10.1016/j.jdeveco.2015.12.004

Fajnzylber, P., Lederman, D., & Loayza, N. (2002). Inequality and violent crime. *Journal of Law and Economics*, 45, 1-39. doi. 10.1086/338347

Ferreira, F.H.G., Chen, S., Dabalen, A., Dikhanov, Y., Hamadeh, N., Jolliffe, D., & Yoshida, N. (2016). A global count of the extreme poor in 2012: data issues, methodology and initial results. *The Journal of Economic Inequality*, 14(2), 141–172. doi. 10.1007/s10888-016-9326-6

GeoNames, 2016. Accees: 20 April 2016. [Retrieved from].

Gilligan, J. (2001) *Preventing Violence*. Thames and Hudson, London.

Greenwald, A.G., Leippe, M.R., Pratkanis, A.R., & Baumgardner, M.H. (1986). Under what conditions does theory obstruct research progress? *Psychological Review*, 93(2), 216-229. doi. 10.1037/0033-295X.93.2.216

Greenwald, A.G., & Ronis, D.L. (1981). On the conceptual disconfirmation of theories. *Personality and Social Psychology Bulletin*, 7(1), 131-137. doi. 10.1177/014616728171020

Herzer, D., & Vollmer, S. (2012). Inequality and growth: evidence from panel cointegration. *The Journal of Economic Inequality*, 10(4), 489–503. doi. 10.1007/s10888-011-9171-6

Hirschman, A.O. (1969) The strategy of economic development. *In* A.N. Agarwal, & S.P. Singh (eds), *Accelerating Investment in Developing Economies*, Oxford Press, London.

Hsieh, C.-C., & Pugh, M.D. (1993). Poverty, income inequality, and violent crime; a meta-analysis of recent aggregate data studies, *Criminal Justice Review*, 18(2), 182-202. doi. 10.1177/073401689301800203

Jencks, C. (1992). *Rethinking Social Policy: Race, Poverty, and the Underclass*. Harper Perennial, New York.

Kelly, M. (2000). Inequality and crime. Review Econ. Stat. 82, 530–539. doi. 10.1162/003465300559028

Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006). World map of the Köppen-Geiger climate classification updated. *MeteorologischeZeitschrift*, 15(3), 259-263. doi. 10.1162/003465300559028

Kovandzic, T.V., Vieratis, L.M., & Yeisley, M.R. (1998). The structural covariates of urban homicide: Reassessing the impact of income inequality and poverty in the post-Reagan era. *Criminology*, 36, 569–599. doi. 10.1177/1088767914557811

Kuo, F.E., & Sullivan, W.C. (2001). Environment and crime in the inner city: Does vegetation reduce crime? *Environment & Behavior*, 33(3), 343-367. doi. 10.1177/0013916501333002

Laird, J.T. (1973). Mental health and population density. *Journal of Psychology*, 85(2), 171–177. doi. 10.1080/00223980.1973.9915647

Lee, B.X. (2016). Causes and cures VIII: Environmental violence. *Aggression and Violent Behavior*, 30, 105-109. doi. 10.1016/j.avb.2016.07.004

Lee, M.R., & Bankston, W. (1999). Political structure, economic inequality and homicide: A cross-national analysis. *Deviant Behaviour*, 20(1), 27-55. doi. 10.1080/016396299266588

Lepore, S.J., Evans, G.W., & Palsane, M.N. (1991). Social hassles and psychological health in the context of chronic crowding. *Journal of Health and Social Behavior*, 32(4), 357–367. doi. 10.2307/2137103

Mackintosh, E., West, S., & Saegert, S. (1975). Two studies of crowding in urban public spaces. *Environment and Behavior*, 7(2), 159–184. doi. 10.1177/001391657500700203

Mapszoom, (2016). Access: June 2016. [Retrieved from].

Merton, R.K. (1938). Social structure and anomie. *American Sociolical Review*, 3(5), 672–682.

Messner, S.F., & Golden, R.M. (1992). Racial inequality and racially disaggregated homicide rates: An assessment of alternative theoretical explanations. *Criminology*, 30, 421–447. doi. 10.1111/j.1745-9125.1992.tb01111.x

Messner, S., & Rosenfeld, R. (1997). Political restraint of the market and levels of criminal homicide: A cross-national application of institutional- anomie theory. *Social Forces*, 75(4), 1393-1416. doi. 10.1093/sf/75.4.1393

Nettler, G. (1984). *Explain Crime*, Mc Graw Hill, NY.

Norris, P. (2015). *Democracy Cross-National Data, Release 4.0 Fall 2015* (New), John F. Kennedy School of Government, Harvard University, Cambridge MA.
Ouimet, M. (2012). A world of homicides: The effect of economic development, income inequality, and excess infant mortality on the homicide rate for 165 countries in 2010. *Homicide Studies*, 16(3), 238–258. doi. 10.1177/1088767912442500
Perkins, D.D., Wandersman, A., Rich, R.C., & Taylor, R.B. (1993). The physical environment of street crime: Defensible space, territoriality and incivilities. *Journal of Environmental Psychology*, 13(1), 29-49. doi. 10.1016/S0272-4944(05)80213-0
Poveda, A. (2011). Economic development, inequality and poverty: an analysis of urban violence in Colombia. Oxford Development Studies, 39(4), 453–468. doi. 10.1080/13600818.2011.620085
Regoeczi, W.C. (2003). When context matters: A multilevel analysis of household and neighborhood crowding on aggression and withdraw-al. *Journal of Environmental Psychology*, 23(4), 451-464. doi. 10.1016/S0272-4944(02)00106-8
Rolfo, S., & Coccia, M. (2005). L'interazionetraricercapubblica e industria in Italia, *l'IndustriaRivista di Economia e PoliticaIndustriale*, 26(4), 657-674.
Rotton, J. (1986). Determinism redux: Climate and cultural correlates of violence. *Environment and Behavior*, 18(3), 346-368. doi. 10.1177/0013916586183003
Rotton, J. (1993). Geophysical variables and behavior: LXXIII. Ubiquitous errors: a reanalysis of Anderson's (1987) "Temperature and Aggression". *Psychological Reports*, 73(1), 259-271. doi. 10.2466/pr0.1993.73.1.259
Rotton, J., & Cohn, E.G. (2000a). Violence is a curvilinear function of temperature in Dallas: A replication. *Journal of Personality and Social Psychology*, 78(6), 1074-1081.
Rotton, J., & Cohn, E.G. (2002). Climate, weather, and crime, R.B. Bechtel & A. Churchman (Eds.), *Handbook of Environmental Psychology*, (pp.481-498), John Wiley and Sons.
Rotton, J., & Cohn, E.G. (2004). Outdoor temperature, climate control and criminal assault: The spatial and temporal ecology of violence. *Environment and Behavior*, 36(2), 276-306. doi. 10.1177/0013916503259515
Schuurman, B., & Horgan, J.G. (2016). Rationales for terrorist violence in homegrown jihadist groups: A case study from the Netherlands. *Aggression and Violent Behavior*, 27, 55-63. doi. 10.1016/j.avb.2016.02.005
Simister, J., & Cooper, C. (2005). Thermal stress in the U.S.A.: Effects on violence and on employee behavior. *Stress and Health*, 21(1), 3-15. doi. 10.1002/smi.1029
Simister, J., & Van de Vliert, E. (2000). Is there more violence in very hot weather? Tests over time in Pakistan, and across countries world-wide. *Pakistan Journal of Meteorology*, 2(4), 51-66.
Stack, S. (1984). Income inequality and property crime: A cross-national analysis of relative deprivation theory. *Criminology*, 22, 229-257. doi. 10.1111/j.1745-9125.1984.tb00299.x
Stolzenberg, L., Eitle, D., & D'Alessio, S.J. (2006). Race, economic inequality, and violent crime. *Journal of Criminal Justice*, 34(3), 303–316. doi. 10.1016/j.jcrimjus.2006.03.002
The Equality Trust, (2011). Income inequality and violent crime. *Equality Trust Research Digest*; 1, 1-5.
United Nations, (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. New York, NY: United Nations [Retrieved from].
Van de Vliert, E., Schwartz, S.H., Huismans, S.E., Hofstede G., & Daan, S. (1999). Temperature, cultural masculinity, and domestic political violence: A cross-national study. *Journal of Cross-Cultural Psychology*, 30(3), 291-314. doi. 10.1177/0022022199030003002
Van de Vliert, E., & Smith, P.B. (2004). Leader reliance on subordinates across nations that differ in development and climate. *The Leadership Quarterly*, 15(3), 381-403. doi. 10.1016/j.leaqua.2004.02.008
Van de Vliert, E., Kluwer, E.S., & Lynn, R. (2000). Citizens of warmer countries are more competitive and poorer: Culture or chance? *Journal of Economic Psychology*, 21(2), 143-165. doi. 10.1016/S0167-4870(99)00040-9
Van Lange, P.A.M., Rinderu, M.I., & Bushman, B.J. (2016). Aggression and violence around the World: A model of climate, aggression, and self-control in humans (CLASH). *Behavioral and Brain Sciences / Target Articles Under Commentary*, doi. 10.1017/S0140525X16000406
Verbrugge, L.M., & Taylor, R.B. (1980). Consequences of population density and size. *Urban Affairs Quarterly*, 16(2), 135–160. doi. 10.1177/107808748001600202
World Bank, (2008). World development indicators. Access: February, 2016. [Retrieved from].
World Bank, (2013). World Development Indicators 2013. Washington, D.C. World Bank. Access: June, 2013. [Retrieved from].
World Development Indicators - The World Bank Group (2014). Access: June 2016. [Retrieved from].