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ASSOCIATION BETWEEN GINI INDEX, GLOBAL PEACE INDEX AND GROSS CAPITAL FORMATION

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Abstract: The purpose of the research was to relate the Gini Index, variable "X", the Global Peace Index, variable "Y" and Gross Capital Formation, variable "Z". The research design is empirical, due to its depth it is descriptive and correlational. The hypothesis was that inequality has a strong relationship with capital formation and a strong effect on violence, while violence affects capital formation. The results are as follows: a) The variables "X", "Y", "Z" have positive asymmetry in their normal distribution. b) An alpha α: 0.05 was used, the two-tailed P (T <= t) test resulted in: 0.003112073, therefore the null hypothesis that there is no relationship is rejected. d) In 54% of countries, violence is related to inequality (in 11> +0.50). e) In 88% of countries, capital is related to inequality (in 35>+0.50). f) In 49% of countries, the peace index is related to capital formation (in 10>+0.50). Conclusion: Managers should work to achieve an average GINI index: ≤ 37 and seek an average violence index ≤ 2.0, in order to achieve an average capital formation between 19.37% and 21.69% of GDP, to attract investments at the maximum profit range.

Keywords (JEL): D24 Capital; D63 Inequality; E22 Investment; F51 International Conflicts; F52 National Security

Abbreviations: [GDP Gross domestic product; GI Gini Index(X); GPI Globa Peace Index(Y); GCF Gross Capital Formation(Z); WB World Bank; IEP Institute for Economic and Peace]

INTRODUCTION

The article addresses inequality as a key element in explaining violence and capital formation in different countries, with the purpose of offering clarity to investors about where it is feasible to recover their capital with less risk and whether inequality plays an important role in this cube of relationships. It offers signals to managers about which variables to strengthen in order to provide capital with all the chemistry that allows it to form or grow, knowing the different relationships and inherent risks.

The GINI index is defined as: The degree to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equitable distribution[1]. On the other hand: Gross capital formation (formerly gross domestic investment) comprises disbursements in the form of additions to the economy's fixed assets plus net changes in the level of inventories[2].

The concept of peace is notoriously difficult to define. The simplest way to approach it is in terms of harmony achieved by the absence of war or conflict. Applied to states, this would suggest that those not involved in wars with neighboring states or suffering from internal violent conflicts have reached a state of peace[3].

These concepts raise the research question: Does income distribution (variable "x") alter the state of peace (variable "y")? Is war or internal conflicts (variable "y") a triggering factor for capital formation (variable "z")? Is the equitable distribution of income (variable "x") an element to manage for capital formation (variable "z")? The gap is that we do not know if the relationship is absolute in the countries studied.

1. *https://datos.bancomundial.org/indicador/SI.POV.GINI?view=map*
2. *https://datos.bancomundial.org/indicator/NE.GDI.TOTL.CD?locations=F1&skipRedirection=true&view=map*
3. *https://www.economicsandpeace.org/reports/*

This tripod of variables leads us to pose the general objective, Identify the degree of relationship between the variable "x", "y", "z", and the specific objective describe how the variables "x", "y", "z" behave individually. The first hypothesis between "x", "y" is that inequality absolutely generates violence, the second hypothesis between "x", "z" is that inequality has a high relationship with capital formation, the third hypothesis is that violence prevents capital formation.

THEORETICAL FRAMEWORK

GINI INDEX

In conclusion of Shahryar, Mohtasham&Amini(2017) In this paper, we consider two well-known methods for analysis of the Gini index, which are U-statistics and linearization for some inequality distributions. In these distributions, in addition, we evaluate two different methods for some properties of their estimators. Also, via some figures, we compare the two methods with jackknife technique in approximating variance and convergence rate of the Gini estimator. Overall, in this note, the results are all favor of linearization method compared to U-statistic technique. Also, a brief study on real data income supports our findings.

According to Baiardi&Morana(2018) We find strong evidence in favor of an EA-wide steady-state financial Kuznets curve, i.e. of a long-term inverse-U shaped linkage between inequality and income development, where financial deepening contributes to a more even distribution of income by lowering the per capita income level at which the turning point of the KC occurs.

(Gomez Zaldívar, Osorio Caballero, & Saucedo Acosta, 2022) Though more empirical and theoretical studies are needed in order to; fully understand the relationship between income inequality and economic complexity, it is clear from existing studies that improving income distribution among the population depends on a range of factors. Therefore, public policies aimed at diminishing inequality should target the entire range of factors impacting it. Empirical evidence suggests that economic complexity is one such factor.

GLOBAL PEACE INDEX

In the studies of Dankévych et als(2023) The modern interpretation of the concept of global peace should be extended to its perception as a comprehensive ideology, which includes legal regulators of countering military conflicts and a wide range of social security institutions for peaceful coexistence of people in the political and legal reality. The elements of the concept of the global world order concept are the functioning of international and national subjects to ensure peace and the development of civil society, which includes the education of the global world order, tolerance, democratic values of constitutionalism, and the rule of law, and other primary legal axiological values.

However the investigations of Bastanifar(2024) The results indicate that a decrease in peace and the outbreak of COVID-19 compelled monetary authorities to reduce the cost of holding money (discount rate) and decrease the cost of keeping money. This will increase global liquidity and may lead to inflation in coming years. Therefore, countries that contribute to a decline in global peace and health should be penalized by bearing the cost of imbalances caused by changes in the cost of holding money. This penalty increases the cost of holding money and opens an opportunity for alternative financing. Additionally, the penalty should be based on a specific rule and logic outlined in the international peace treaty, as emphasized by Keynes at the conference of Versailles.

GROSS CAPITAL FORMATION

Meanwhile Zhao, Gao & Yang (2024) Constructing digital public capital requires comprehensive coverage, including the building of a "5+1" system that encompasses the fields of politics, the economy, culture, technology, finance, and the military.

MATERIALS AND METHODS

The research is empirical, because its depth is descriptive and correlational, its inference is hypothetical, the databases of the variables are quantitative, and the temporality is longitudinal or diachronic. The general objective was to establish the relationship between the Gini Index (GI) and the Global Peace Index (GPI); the Gini Index (GI) and Gross Capital Formation (GCF); the Global Peace Index (GPI) and Gross Capital Formation (GCF) and the specific objective was to graph the form of the variables with descriptive statistics. The hypothesis was that: the Gini Index (GI), Global Peace Index (GPI) and Gross Capital Formation (GCF) have a high relationship. The population of the databases is 217 countries (including islands and administrative areas) for the Gini Index (GI), 163 for the Global Peace Index (GPI) and 217 for Gross Capital Formation (GCF). A representative sample for this population by the "Sturges rule" K=1+3.3(log n) would be: 9 countries in the three populations. The normal distribution for the population of each variable was developed. In the correlation analysis for the three variables, it was calculated for 161 countries.

1. In the variable (X) Gini Index from 1990 to 2020 in 217 countries, obtained from: *https://databank.worldbank.org/source/world-development-indicators*
2. For the variable (Y) Global Peace Index from 2009 to 2023 by country, the Institute for Economics & Peace database was used at: *https://www.economicsandpeace.org/reports/*
3. For the variable (Z) Gross Capital Formation from 2009 to 2023 from the World Bank available at: *https://databank.worldbank.org/source/world-development-indicators*
4. The research model used three variables, figure 1:

RESULTS AND DISCUSSION

1. The normal distribution of the GINI index figure 2,

$\Phi\mu,\sigma^2\ (x)= \int_{(-\infty)}^{x} \varphi\ \mu,\sigma^2\ (u)du=1/(\sigma\sqrt{(2\ \pi\ )})\ \int_{(-\infty)}^{x} [\![\ e]\!]^{-.^{(((u-\mu)^2)/(2\sigma^2))}}\ du,x\in R$[4] shows that the Gini index have positive asymmetry in 217 countries.

2. The normal distribution of the Global Peace Index figure 3,

$\Phi\mu,\sigma^2\ (x)= \int_{(-\infty)}^{x} \varphi\ \mu,\sigma^2\ (u)du=1/(\sigma\sqrt{(2\ \pi\ )})\ \int_{(-\infty)}^{x} [\![\ e]\!]^{-.^{(((u-\mu)^2)/(2\sigma^2))}}\ du,x\in R$[5] shows that the Peace in 125 countries has positive asymmetry from 2009 to 2023.

3. The normal distribution of the Gross Capital Formation figure 4,

$\Phi\mu,\sigma^2\ (x)= \int_{(-\infty)}^{x} \varphi\ \mu,\sigma^2\ (u)du=1/(\sigma\sqrt{(2\ \pi\ )})\ \int_{(-\infty)}^{x} [\![\ e]\!]^{-.^{(((u-\mu)^2)/(2\sigma^2))}}\ du,x\in R$[6] shows that the capital in 125 countries has positive asymmetry from 2009 to 2020.

4. The correlation coefficient figure 5:

$r_{xy}=(\sum(X-\bar{X})(Y-\bar{Y}))/\sqrt{(\sum(X-\bar{X})^2\ \Sigma(Y-\bar{Y})^2\ )}$[7] between the GINI and the Global Peace Index, shows a relationship where there are 76 countries with a positive correlation and 63 countries with a negative coefficient, meanwhile ten countries with the highest correlation in go down order:

4. *https://www.ime.usp.br/~walterfm/cursos/mac5796/DoctrineOfChances.pdf ; formula taken of Alvarado et als 2024*
5. *https://www.ime.usp.br/~walterfm/cursos/mac5796/DoctrineOfChances.pdf ; formula taken of Alvarado et als 2024*
6. *https://www.ime.usp.br/~walterfm/cursos/mac5796/DoctrineOfChances.pdf ; formula taken of Alvarado et als 2024*
7. https://archive.org/details/philtrans09662059/page/n1/mode/2up ; *formula taken of Alvarado et als 2024*

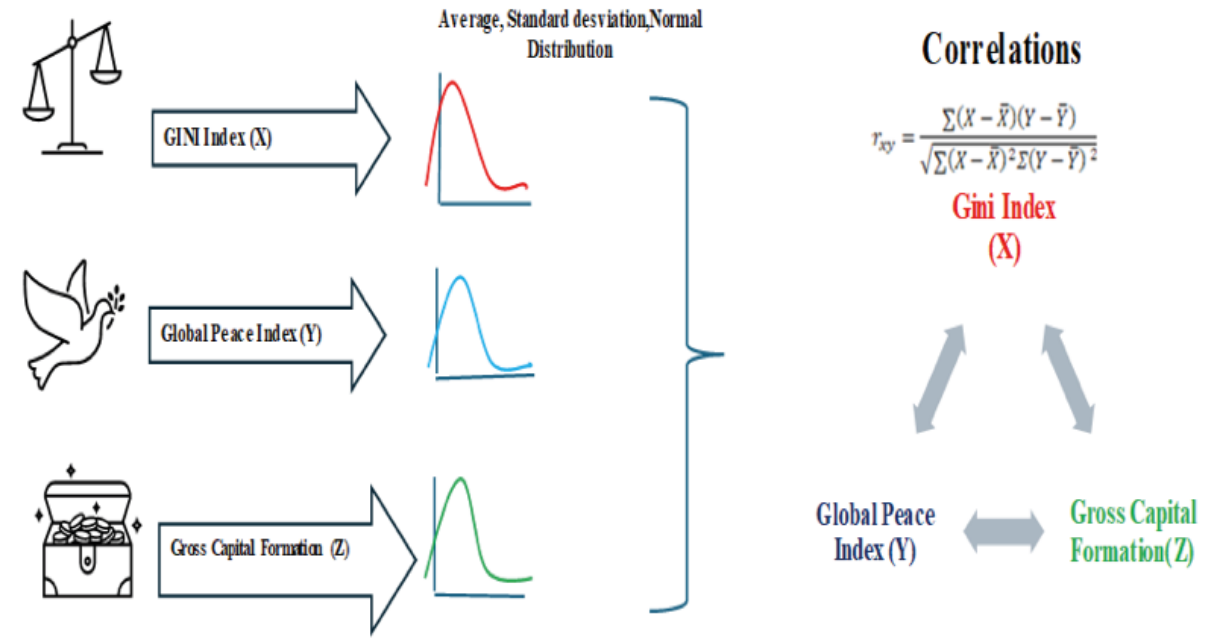

Figure 1: Three variables research model X, Y, Z

Source 1: Authors 2024' elaboration based on Data World Bank, Institute for Economic and Peace

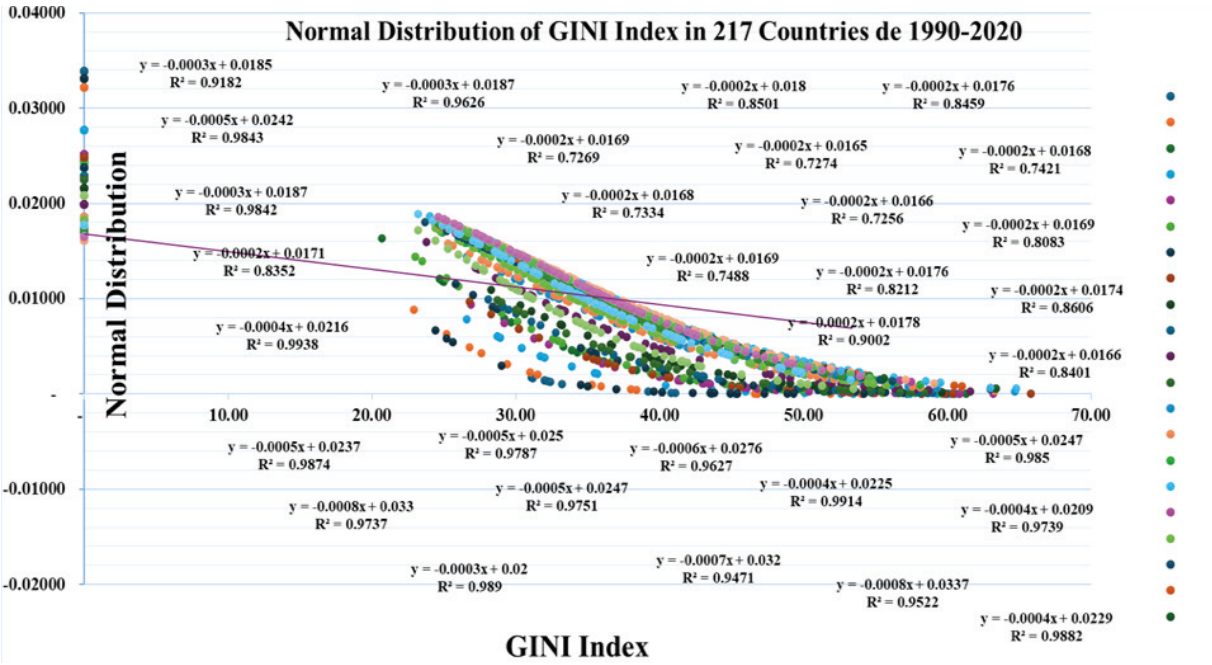

Figure 2 : Normal Distribution of the Gini Index from 1990 to 2020 with positive asymmetry

Source 2: Authors 2024 verification of Alvarado,Almendarez&Ceroni(2022)' World Bank database[1]

1. *https://databank.worldbank.org/source/world-development-indicators*

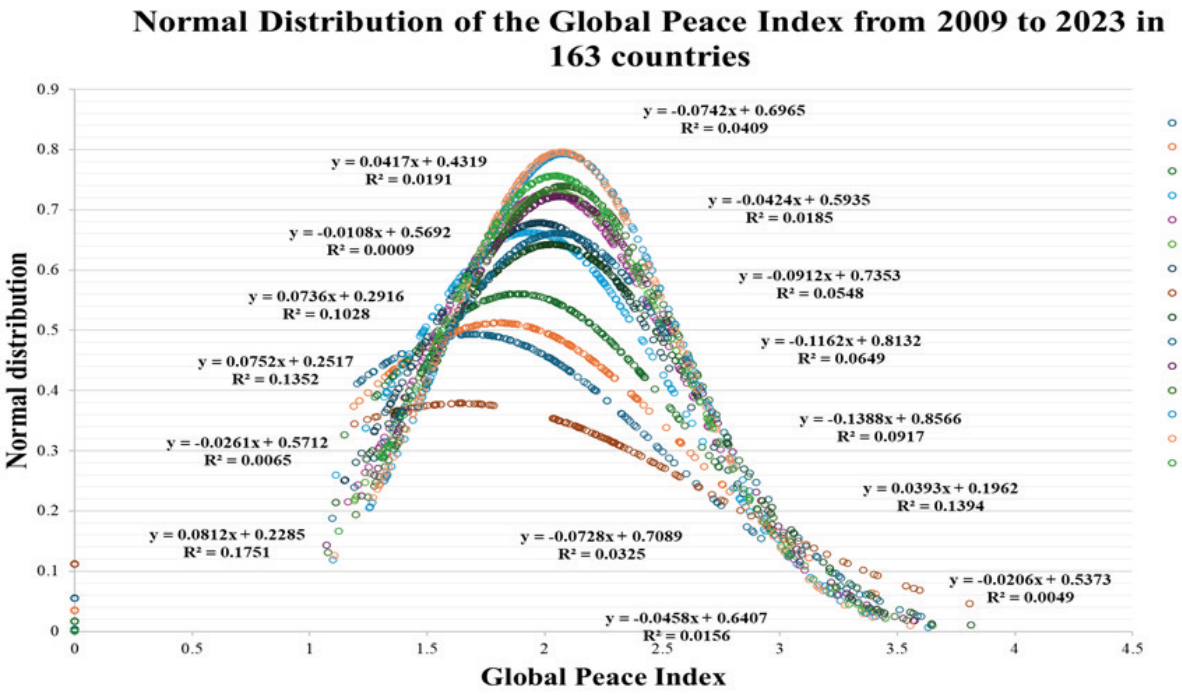

Figure 3: Normal Distribution of the Global Peace Index from 2009 to 2023

Source 3: Authors 2024' elaboration using Institute for Economic and Peace database[2]

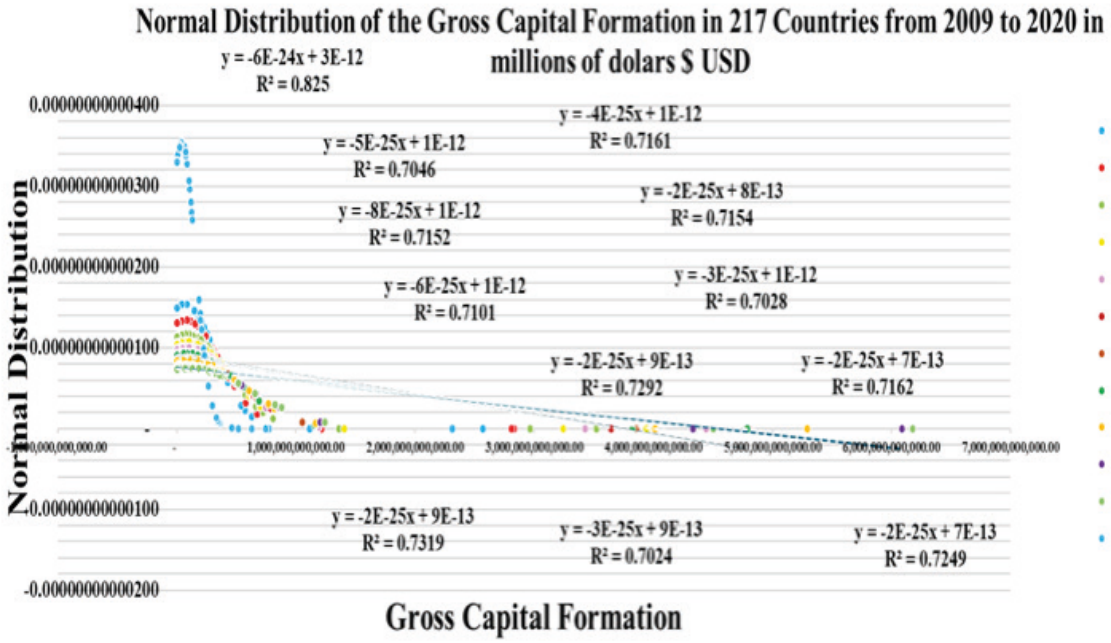

Figure 4: Normal Distribution of the Gross Capital Formation from 2009 to 2020

Source 4: Authors 2024, verification of Alvarado et als(2023)' elaboration using World Bank database[3]

2. https://www.economicsandpeace.org/reports/

3. https://databank.worldbank.org/source/world-development-indicators

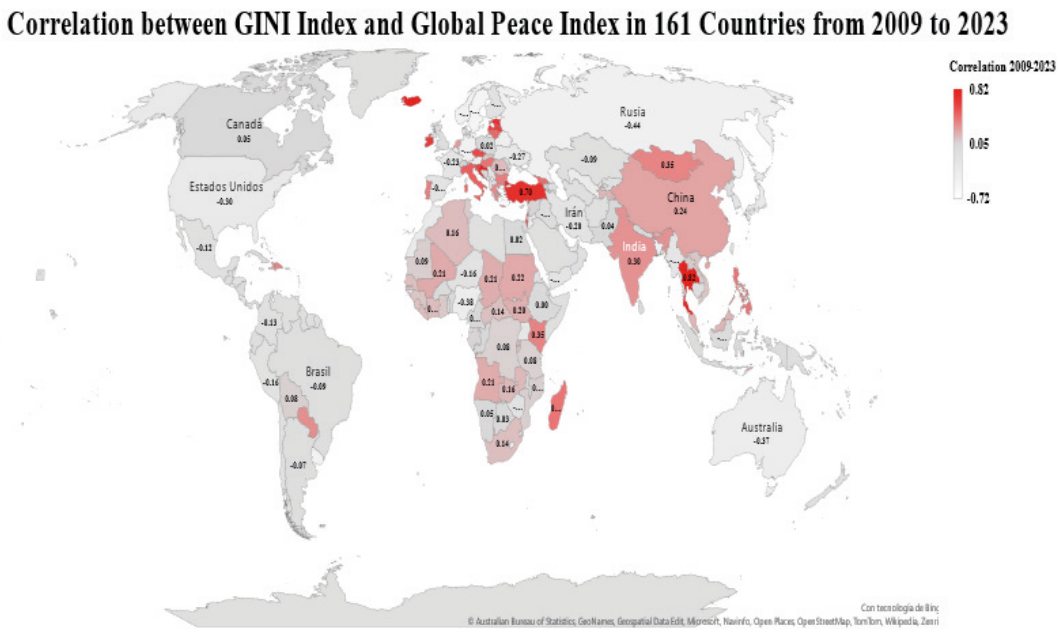

Figure 5: Correlation map by country between GINI and Global Peace Index from 2009 to 2023

Source 5: Prepared with Bing 2024, World Bank[4] and IEP[5] database

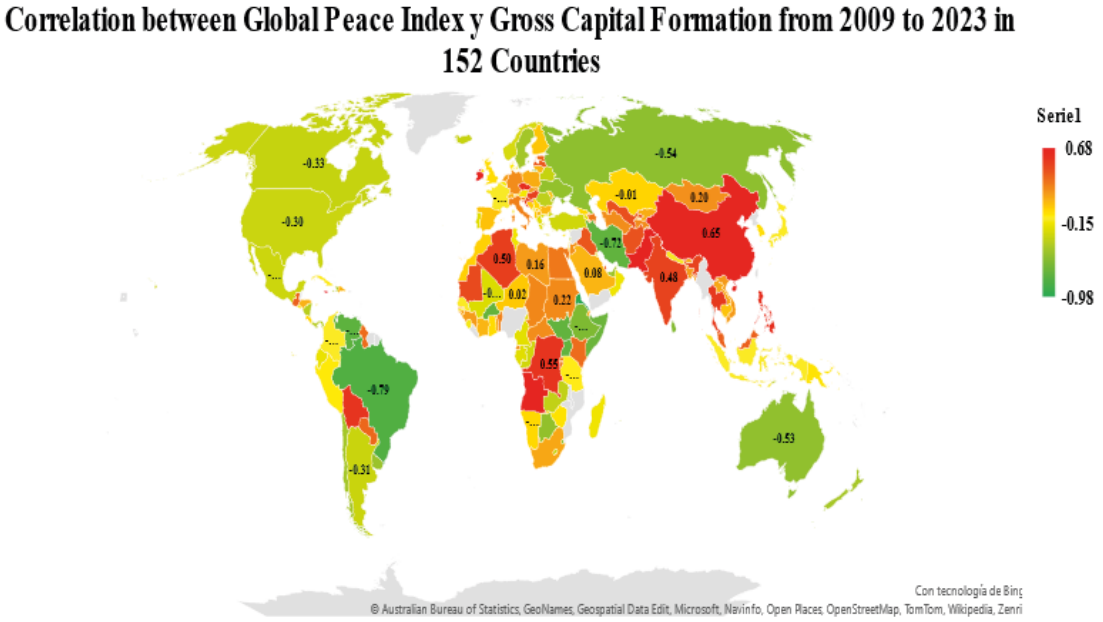

Figure 6: Correlation map by country between global peace index and gross capital formation from 2009 to 2023 in 152 countries

Source 6: Prepared with Bing 2024, World Bank[6] and IEP[7] database

4. https://databank.worldbank.org/source/world-development-indicators
5. https://www.economicsandpeace.org/reports/
6. https://databank.worldbank.org/source/world-development-indicators
7. https://www.economicsandpeace.org/reports/

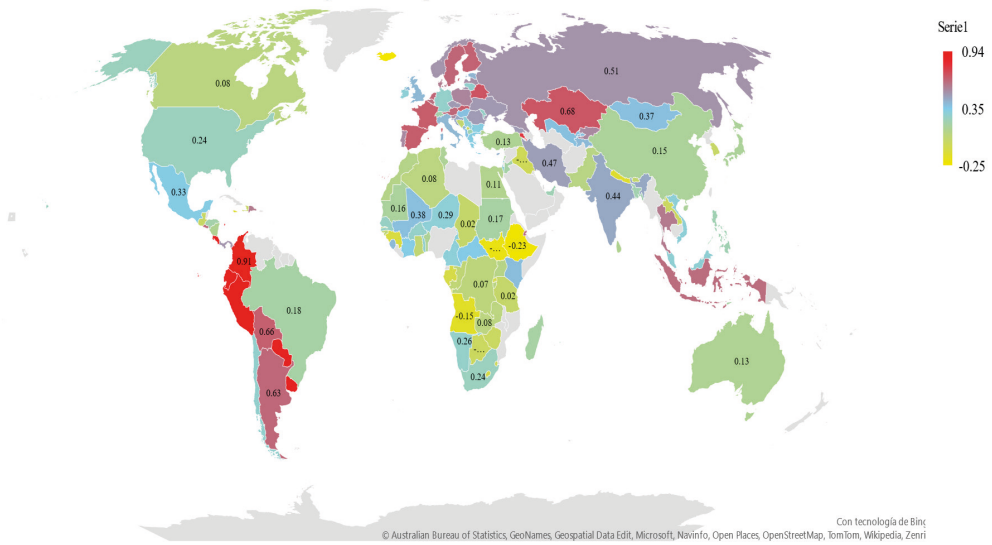

Figure 7: Correlation map by country between GINI index and gross capital formation from 2009 to 2023 in 133 countries,

Source 7: Prepared with Bing 2024, World Bank[8] database

8. https://databank.worldbank.org/source/world-development-indicators

Thailand, Croatia, Iceland, Turkey, Estonia, Ireland, Slovenia, Latvia, Czech Republic, Israel and the 10 with the highest negative correlation: Kosovo, Sweden, Uruguay, Norway, Bangladesh, Germany, Lesotho, Russia, Belarus, Belgium. *https://photos.app.goo.gl/HDfxpKhp1u68zwFt7*

5. The correlation coefficient figure 6:

$r_{xy}=(\sum(X-X^{-})(Y-Y^{-}))/\sqrt{(\sum(X-X^{-})^2\,\Sigma(Y-Y^{-})^2}$ [8] between the global peace index and the gross capital formation, It map shows that there are 75 countries with positive correlation and 77 countries with negative coefficient, among the ten countries with the highest positive correlation in go down order: Pakistan, Jamaica, Ireland, Angola, China, Czech Republic, Bahrain, Philippines, Democratic Republic of the Congo, Bolivia and the 10 with the highest negative correlation: Brazil, Venezuela, Uganda, Iran, South Sudan, Burkina Faso, Somalia, Ethiopia, Sri Lanka, Eswatini, Russia. *https://photos.app.goo.gl/Re6m51nUF2gBGBwLA*

6. The correlation coefficient figure 7:

$r_{xy}=(\sum(X-X^{-})(Y-Y^{-}))/\sqrt{(\sum(X-X^{-})^2\,\Sigma(Y-Y^{-})^2}$ [9] It map shows that there are 117 countries with positive correlation and 16 countries with negative coefficient, among the ten countries with the highest correlation in go down order: Costa Rica, Ecuador, Peru, Colombia, Uruguay, Paraguay, Armenia, Belarus, Kazakhstan, France and the 10 with the highest negative correlation: Iceland, Ethiopia, South Sudan, Angola, Nepal, Jamaica, Guinea, Gabon, Lesotho, Rwanda. *https://photos.app.goo.gl/ZHZjnhZgwF4eFmQR9*

DISCUSSION

1. We agree with Shahryar on the use of the linearization method, if it is by matrices. As for Baiardi's conclusions, it is similar to the results in that the Gini index has positive asymmetry. Meanwhile, public policies aimed at reducing inequality must target the entire spectrum of factors that affect it and which, from this perspective, are various relationships of variables.

8. *https://archive.org/details/philtrans09662059/page/n1/mode/2up ; formula taken of Alvarado et als 2024*

9. *https://archive.org/details/philtrans09662059/page/n1/mode/2up ; formula taken of Alvarado et als 2024*

2. Although (Dankévych, 2023) The modern interpretation of the concept of global peace should be extended to its perception as a comprehensive ideology, research finds that most countries are located with an index greater than 1.50-3.50. When (Bastanifar, 2024) The results indicate that the decline in peace and the outbreak of COVID-19 forced monetary authorities to reduce the cost of holding money (discount rate) and decrease the cost of holding money, this is what happened.

3. Zhao's 5+1 methodology seems reasonable but must be seen in light of economic data.

CONCLUSIONS

1. The three variables have positive asymmetry: Figure 2, Figure 3 and Figure 4; an alpha level α: 0.05 was used, the two-tailed P(T<=t) test generated the result: 0.003112073, so the null hypothesis that there is no relationship is rejected. c) In the relationship "X" and "Y" there are 63 countries with a negative correlation and 76 countries with a positive correlation. d) In the relationship between "X" and "Z" there are 16 countries with a negative correlation and 117 countries with a positive correlation. In the relationship between "Y" and "Z" 77 countries with a negative correlation and 75 countries with a positive correlation were discovered.

2. The ideal economic environment for an investor between the GINI index and the global peace index Figure 5, would be: low inequality, low violence and a negative correlation greater than -0.50, the class A country, Sweden. There are class B countries that manage inequality well, and have low violence, but a high correlation greater than +0.50, so an increase in inequality could trigger violence. Among these are: Iceland, Ireland, Slovenia and the Czech Republic. We have 18 class C countries that are among the best in inequality management 20-30 but have a violence index greater than 1.50-3.5 so other variables must be reviewed. And finally, group D, of countries that are unequal between 31 and 70, with a violence index greater than 1.50-3.50, but the best positioned is Uruguay with a correlation of -0.51, then those that could increase their violence due to inequality we have: Israel, Latvia, Estonia, Turkey and Thailand.

3. In the association between the GINI index and Gross Capital Formation, where the ideal would be a low Gini, a high GCF and a negative correlation, in Figure 6, the following were found: a) 11/22 countries that best manage the GINI index between 20 and 30, with highly correlated variables greater than +0.50, which means that having a Gini index management allows them to generate capital of 22% of GDP, accelerated. b) There are 10/74 countries, with an inequality between 31 to 40 but that have a correlation greater than +0.50, which allows them a gross capital formation of 21.40% of fluid GDP. c) With a GINI index between 41 and 50 we have 10/33 countries with a correlation greater than +0.50 with FBC 17.49% of spontaneous GDP and finally with an index between 51 and 70 and an average capital of 23% of GDP, we have 1 of 14 countries, with a correlation greater than +0.55, and 3 of 10 for which the high level of inequality does not affect capital formation.

4. In the relationship between the Global Peace Index and gross capital formation we have a) 18 countries, with a violence index between 1.0-1.50 and a capital formation of 23.66% of GDP, of which the best correlation to generate capital with the variable peace are: Ireland, Czech Republic and the country in which violence does not affect capital generation is Australia. b) There are 77 countries that have a global peace index between 1.50-2.00 and a capital formation of 25.77% of GDP, no correlations greater than +0.50 were found, but it was identified that in Botswana capital formation is not affected by violence with a correlation of -0.51. d) In third place, 8 of 57 countries have a violence between 2.01-3.00 with a capital formation of 24.11% of GDP and with correlations greater than +0.50. d) Finally, a group of countries that have a violence between 3.01-3.50 where 1 of 10 countries has a correlation greater than +0.50 (Congo) and others with a negative correlation greater than -0.50 which are Russia, Somalia and South Sudan.

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