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The Influence of the Regional and Income Classification Variation on the Background Parameters of Peace Index Score

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ABSTRACT- The Institute for Economics and Peace (IEP) annually releases the Global Peace Index Score (PIS) for 163 countries spanning diverse geographic regions and varying income categories. The present study delves into the distribution patterns of three underlying indices comprising the PIS: (i) ongoing domestic and international conflict domain (DODNIC); (ii) social safety and security domain (DSSNS) and (iii) militarisation domain (DM) over five geographic region and four income categories of all 163 countries. The study meticulously examines the inter-correlations and various descriptive statistics pertaining to the three foundational index scores. Furthermore, it draws insightful comparisons with factors such as population percentage and population densities across the countries under scrutiny. In its final phase, the study rigorously tests the impact of categorical variables like country region and income category on the interplay of the three background index scores within the Global Peace Index (PIS) framework. Employing the robust linear regression technique, the study compellingly concludes that while the country region indeed emerges as a significant determinant, income category, intriguingly, remains statistically insignificant in influencing peace scores.

KEYWORDS- Peace Index Score, Geographic Regions, Population Percentage, Population Densities, Income Category

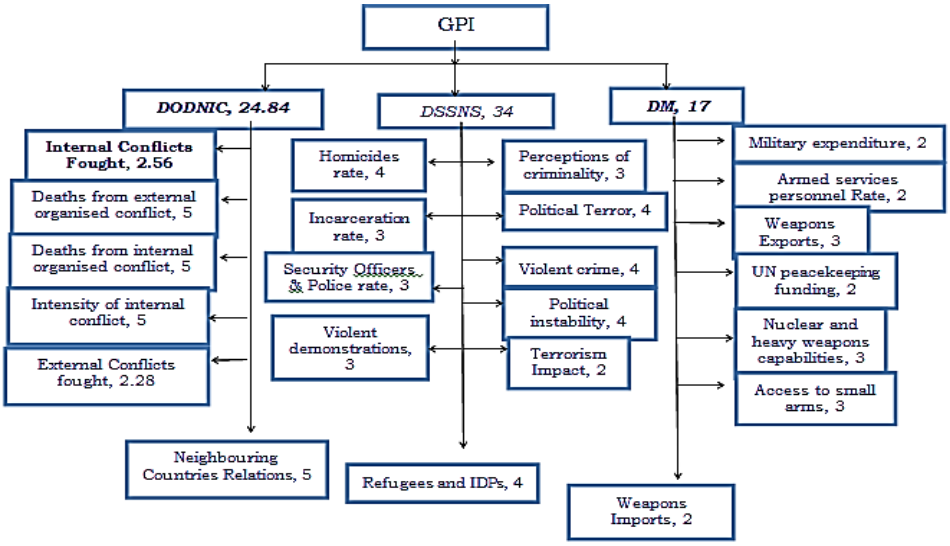
I. INTRODUCTION

The Global Peace Index (GPI) is the brainchild of a group of esteemed social scientists, carefully designed to quantify and gauge the state of peace across various nations. This ground-breaking concept of a peace index was initially introduced by Steve Killelea in 2007, and over time, it has evolved with the creation of diverse metrics and methodologies to provide a comprehensive assessment of global peace conditions. Several theorists have posited that the pursuit of national security hinges upon the maximization of national power [5] [7] [12] [13]. In the past, certain researchers made a clear distinction between positive and negative peace, delineating the former as a state characterized by social justice and the absence of violence [4]. Studies have noted that the concept of peace is subject to varying interpretations, with a lack of consensus regarding its visibility [11] (Kreck, 1989). Some define peace as the minimization of military activities within the context of specific political objectives [15]. Some perspectives incorporate elements of social justice, the rule of law, and political freedom alongside the reduction of military activities [3]. Furthermore, others conceptualize peace as encompassing the restoration of human rights, socio-economic development, global security, and a pursuit of equality [6]. Certain researchers have asserted that peace stands as a fundamental prerequisite for the attainment of happiness [14]. From the vantage point of political science, individuals perceive peace as a means to enhance political relationships [10]. Amidst this intricate landscape, theories have also recommended a more comprehensive perspective, urging an examination of the concept of peace within the framework of plurality [2]. Hence, the endeavour to pinpoint a specific definition of peace is an intricately complex task, one that often teeters on the brink of near-impossibility [1]. Regardless of the theories guiding our understanding, it remains evident that the complexities and nuances of peace values exhibit variances across different geographic regions and income categories within countries. The Institute for Economics and Peace (IEP) has commendably undertaken the task of constructing the Peace Index Score (PIS) for 163 nations worldwide over the past few years. In this context, the significance of background parameters in shaping the maturity of the Peace Index Score becomes strikingly apparent.

The present study seeks to delve into the patterns and the pivotal role played by these background parameters in their distribution across distinct country regions and income categories.

A. Background

The constriction of index of peace by IEP with consideration of significant variables with respective weight is given in chart-1. The index is termed as Gross Peace Index (GPI).



(Source: http://visionofhumanity.org/reports)

Figure 1: Construction Index of GPI & Its Various Metrics

To study the Edifice course in detail, the study institute indexes it broadly and subdivides it into three classifications. The first subgroup is grounded in the domain scenario and encompasses information regarding ongoing domestic and internal conflicts (DODNIC). This classification assembles six factors, such as the frequencies and durations of internal conflicts, occurrences of human life loss from both internally and externally organized conflicts, concentration of regulated internal conflicts, frequencies, durations, and the role of countries in external conflicts, as well as the relationship of the country with its neighbor. The second sub-group, termed the domain of Societal Safety and Security (DSSNS), primarily focuses on assessing the safety levels of the citizens in their everyday lives. It encompasses eight indicators, including the quantity of homicides per hundred thousand people, the frequency of incarcerated population per hundred thousand, the number of internal security officers and police per hundred thousand people, the likelihood of violent demonstrations, the level of perceived criminality in society, ranking on the political terror scale, the level of violent crime, the degree of political instability within the country, the impact of terrorism, and the number of refugees and internally displaced people as a percentage of the population, according to the Office of the High Commissioner for Refugees (UNHCR) Mid-Year Trends. The third classification is known as the domain of militarization (DM), which is based on parameters such as military expenditure as a percentage of GDP, the number of armed services personnel (military) per hundred thousand people, the volume of transfers of major conventional weapons as a supplier (exports) per one hundred thousand people, financial contributions to UN peacekeeping missions, nuclear and heavy weapons capabilities, ease of access to small arms and light weapons, and the volume of transfers of major conventional weapons as a recipient (imports) per one hundred thousand people. Thus, a total of 23 parameters are used as indicators for the classifications of the Gross Peace Index. These variables are distributed into quantitative and qualitative groups, and the entire database used for the calculation of indices is updated on an annual basis. Weight construction is a crucial aspect of index formation, and for this purpose, the Institute of Economics and Peace (IEP) considers two main facets of the peace-making process: one is the internal side, and the other is the external side. Under this mechanism, the weight distribution ratio between internal and external factors is 60:40, respectively. All these 23 metrics are allocated to both the internal and external peace-making processes and classified on a 1-to-5-point scale. The weights conceptualized by IEP are provided in Chart 1. As we know, weights are indicators that show the relative strength of the indicators. In this regard, the intensity of internal conflicts and the frequencies of deaths from internal conflicts are the most significant among the internal peace-making indicators. Meanwhile, relations with neighbouring countries and the frequencies of deaths from external conflicts are exceptional for the external peace-making process.

The homicide rate, violent crime, political instability, and political terror also play significant roles as contributors to internal indicators. The number of refugees and internally displaced people as a percentage of the population, as reported by the Office of the High Commissioner for Refugees (UNHCR) mid-year trends, holds significance for external peace indicators. Out of the 23 indicators, eight are qualitative, and fifteen are quantitative. Among these eight qualitative indicators, seven were generated by collecting data at the country level through a digital platform, taking into account the significant characteristics of each country related to the political, economic, and social environment. Taking these metrics into consideration, the IEP prepares three basic index rankings, which cover (i) the ongoing domestic and international conflict domain (DODNIC), (ii) the social safety and security domain (DSSNS), and (iii) the militarization domain (DM). These index scores are arranged from the most peaceful to the most worsening states globally, using the World Bank's list of 163 countries. The lowest score on the index implies a higher level of peacefulness for the country. By combining all three indexes through a weighted average method, the final Global Peace Index (GPI) is derived.

II. DATA AND METHODS

The present study, taking into account the features of the index scores, aimed to investigate the distribution of peace as estimated by the IEP in two broad aspects: region-specific and income category-specific. The World Bank has already established region-wise income categorization of countries into four classifications: high income (HI), upper-middle income (UMI), lower-middle income (LMI), and low income (LI). Based on the World Bank classification, the geographic regions were developed in the study by amalgamating some proximate locations and also addressing the issue of having too many groups. The geographical regions are as follows: (i) East Asia, South East Asia and Pacific (EASEANP), (ii) Europe and Central Asia (ENCA), (iii) North America, Latin America and the Caribbean (NALANC), (iv) Middle East and North Africa (MENNA), and (v) Sub-Saharan Africa (SSA). The distribution of countries across geographic regions reveals that the ENCA region has the highest number of countries, followed by the SSA region. In terms of income categories, UMI countries comprise 47 countries, which is 28.8 percent of the total, while LI countries account for 19 percent of the total (Table-1). Population size is a significant factor to consider in this context, and population density is another notable factor, especially in LMI and LI countries, which may influence the criteria for assessing peace in the usual sense. The cross-tabulation between income categories and country regions (Table-2) shows that in the EASEANP region, the maximum number of existing countries is from the LMI group. In the NALANC region, most countries are from the UMI category. In the SSA region, the majority are in the LI group, with some in the LMI group. In the ENCA region, the highest number of countries are in the HI and UMI groups. In the MENNA region, we find a combination of HI, UMI, and LMI countries.

Table 1: Distribution of countries over Geographic Region & Income Categories

Levels	Counts	% of Total	Cumulative %
EASEANP	26	16.0 %	16.0 %
NALANC	25	15.3 %	31.3 %
SSA	44	27.0 %	58.3 %
ENCA	48	29.4 %	87.7 %
MENNA	20	12.3 %	100.0 %
HI	45	27.6 %	27.6 %
UMI	47	28.8 %	56.4 %
LMI	40	24.5 %	81.0 %
LI	31	19.0 %	100.0 %

(Source: www.worldbank.org)

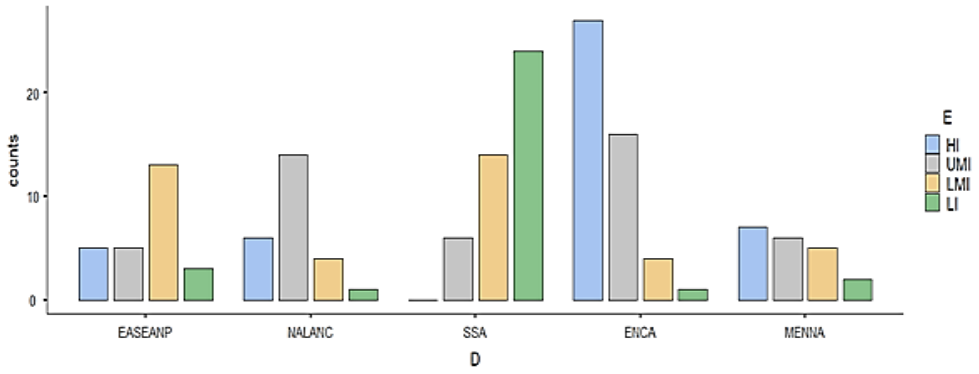
Table 2: Distribution of Countries between Income and Region Category

REGION	INCOME			
	HI	UMI	LMI	LI
EASEANP	5	5	13	3
NALANC	6	14	4	1
SSA	0	6	14	24
ENCA	27	16	4	1
MENNA	7	6	5	2

(Source: www.worldbank.org)

III. RESULTS AND DISCUSSION

The results of the cross-tabulation between income and country regions are presented in Figure-1. It illustrates that the SSA region and ENCA region are inversely related in terms of income categories. By examining Table-2, the study suggests that HI countries may significantly influence peace in the ENCA region or vice versa. Similarly, UMI countries play a crucial role in the NALANC and ENCA regions, LMI countries in the EASEANP and SSA regions, and LI countries in the SSA region. However, for the MENNA region, we do not observe such a heavy concentration of any one income category of countries. These patterns are highlighted in the boxes in Table-2



(Source: www.worldbank.org)

Figure1: Distribution of Countries between Income and Region Category

Table 3: Descriptive Statistics of Population Density and Population Percentage

	Population Density	Population %
N	163	163
Missing	0	0
Mean	192	0.613
Median	78.8	0.147
Mode	2.04	0.00467
Standard deviation	656	2.07
Variance	430177	4.28
Range	7951	18.4
Minimum	2.04	0.00467
Maximum	7953	18.5
Skewness	10.7	7.74
Kurtosis	125	63.9
25th percentile	30.6	0.0628
50th percentile	78.8	0.147
75th percentile	138	0.442

(Source: Author Calculation)

The demographic characteristics of these 163 countries are presented in Table-3, focusing on population density and percentage of the population. The average population density is 192 per square kilometre, and the average population percentage is 0.613. As the study is concerned with the distribution of peace across the globe, considering country regions and income categories, the contribution of population percentage within these regions and income categories assists in better understanding the demographic distribution. Table-4 illustrates the cross-tabulation of population percentages between country regions and income categories.

Table 4: Distribution of Population Percentage Between Country Region and Income Categories

	HI	UMI	LMI	LI	TOTAL
EASEANP	2.89	**20.76**	**30.98**	1.23	**55.86**
ENCA	**6.66**	4.35	1.17	0.14	12.33
MENNA	0.89	0.25	**2.05**	0.50	3.69
NALANC	**5.30**	**7.62**	0.46	0.15	13.53
SSA	0.00	0.91	**6.24**	**7.43**	14.58
TOTAL	15.75	**33.89**	**40.90**	9.45	100.00

(Source: Author Calculation)

Table 5: Distribution of Average Population Density over Region and Income Category

	HI	UMI	LMI	LI	TOTAL
EASEANP	1770.21	279.75	239.57	268.96	545.04
ENCA	129.79	66.56	77.75	65.57	103.81
MENNA	438.06	156.99	210.88	73.02	260.44
NALANC	68.63	82.70	114.94	403.60	97.32
SSA	0.00	122.13	65.44	110.63	97.52
TOTAL	351.86	113.69	146.39	132.22	

(Source: Author Calculation)

The study observes that the maximum population distribution is found in the EASEANP region and the LMI category. The minimum population burden falls on the MENNA region and LI countries. Factors like population density also help us understand the number of persons per square kilometre in specific geographic regions and income category countries. Table-5 explains these facts for the regions and income categories. Similar to population percentage, the average population density is highest in EASEANP region countries and among income categories; it is highest for HI countries. The cross-tabulation in the study reveals that HI countries in the EASEANP region face the highest population density, and the corresponding minimum is for LMI countries in the SSA region. In fact, the following combinations of region and income categories (ENCA, UMI), (ENCA, LI), (NALANC, HI), and (SSA, LMI) exhibit close average population densities.

Table 6: Descriptive Statistics of Index Scores Calculated by IEP

	DODNIC	DSSNS	DM	PIS
N	163	163	163	163
Missing	0	0	0	0
Mean	1.78	2.50	1.87	2.10
Median	1.60	2.49	1.82	2.05
Mode	1.40	1.26 *	1.17 *	1.50 *
Standard deviation	0.664	0.661	0.422	0.522
Variance	0.440	0.437	0.178	0.273
Range	2.83	3.11	2.89	2.57
Minimum	1.00	1.16	1.03	1.08
Maximum	3.83	4.28	3.91	3.64
Skewness	1.17	0.270	1.34	0.756
Std. error skewness	0.190	0.190	0.190	0.190
Kurtosis	0.648	0.0605	3.63	0.482
Std. error kurtosis	0.378	0.378	0.378	0.378
Shapiro-Wilk p	< .001	0.018	< .001	< .001
20th percentile	1.30	1.93	1.56	1.70
40th percentile	1.41	2.40	1.73	1.93
60th percentile	1.79	2.58	1.90	2.13
80th percentile	2.29	3.00	2.12	2.48

* More than one mode exists, only the first is reported

Source: Author Calculation

Regarding the Peace Index score, the study thoroughly examines the three foundational components of the Peace Index score across various regions and income categories of different nations. IEP produces three index scores for 163 countries, which are abbreviated as (i) DODNIC, (ii) DSSNS, and (iii) DM. The collective final score is the Peace Index Score (PIS). Descriptive statistics of the index scores reveal that the mean and median values of DSSNS are considerably higher compared to the other two components, and the variation (variance) in the DM scores is relatively stable (low) when compared to DODNIC and DSSNS. The range of variation is highest for DSSNS, but the skewness of DODNIC and DM is relatively higher (positively skewed) than DSSNS, implying that the distribution of DODNIC and DM may have a long right tail. The high kurtosis of DM

indicates the influence of outliers in the derived index score values. For all considered indices, the Shapiro-Wilk test of normality confirms that the distribution pattern of all three indices follows a normal distribution, although it's important to note that the index scores are not of a continuous nature.

The original PIS is categorized by IEP into five categories: very high (VH), high (H), medium (M), low (L), and very low (VL). This categorization is determined by calculating the 20th, 40th, 60th, and 80th percentiles of the index score. The study aims to make inter-comparisons between DODNIC, DSSNS, and DM. Therefore, percentiles were calculated for each index, and the categories are also created based on these respective percentile limits. According to the classification of the three index scores, the study finds that the distribution of the five categories among the 163 countries varies, as shown in Table 7.

Table 7: Percentage Distribution of Countries between Five Score Categories of Three Indices

	DODNIC	DSSNS	DM
VH	20.25	20.25	19.63
H	19.02	20.86	20.25
M	20.86	17.79	20.25
L	19.63	20.86	20.25
VL	20.25	20.25	19.63

(Source: Author Calculation)

The distribution pattern for the average values of the three index scores, DODNIC, DSSNS, and DM, across five country regions and four income class classifications is presented in Table-8. A crucial aspect of constructing these indices is that an equal number of countries (as shown in Table-2) are distributed across regions for all indices.

The distribution pattern of the average index scores for DODNIC, DSSNS, and DM reveals that for HI countries in the ENCA and EASEANP regions, the score is less than 2, confirming that in these two regions, HI countries perform significantly better relative to others. Similarly, in these two regions, LI countries are concentrated in the right tail part of the distribution for all three index scores. A similar pattern is also found for LI and LMI countries in the MENNA region.

Table 8: Average Score of Dodnic, Dssns & Dm over Region and Income Category

Region	Income Cat	DODNIC	DSSNS	DM
EASEANP	LI	2.55	3.27	2.58
	UMI	1.59	2.34	1.69
	LMI	1.92	2.47	1.8
	HI	1.25	1.36	1.77
ENCA	LI	2.06	2.56	1.77
	UMI	1.8	2.48	1.91
	LMI	2.17	2.66	1.8
	HI	1.25	1.69	1.68
MENNA	LI	3.72	3.88	2.46
	UMI	2.62	3.12	2.33
	LMI	2.16	2.61	2.01
	HI	1.81	2.11	2.38
SSA	LI	2.09	2.94	1.86
	UMI	1.3	2.51	1.69
	LMI	1.96	2.79	1.84
	HI	NaN	NaN	NaN
NALANC	LI	1.8	2.73	1.93
	UMI	1.62	2.91	1.79
	LMI	1.61	3.11	1.82
	HI	1.3	2.26	1.89

(Source: Author Calculation)

To understand the distribution of index scores across different regions and income categories of countries, another useful tool is the standard deviation or variance. Table-9 presents the variance of index scores across the regions and income categories.

For the index DODNIC, the minimum variances are found in combinations such as (ENCA, HI), (MENNA, LI), (SSA, UMI), and (NALANC, HI). Similarly, for DSSNS, the combinations include (EASEANP, HI), (ENCA, HI), (MENNA, LI), and (MENNA, LMI). For DM, the combinations with the minimum variances are (EASEANP, UMI), (MENNA, LI), (MENNA, UMI), (MENNA, LMI), (SSA, LI), (SSA, UMI), (SSA, LMI), (NALANC, UMI), and (NALANC, LMI). Minimum variances indicate that for a specific index under a particular region and income category, the variation between index scores is not substantial; they are closely clustered. The maximum variance for DODNIC, DSSNS, and DM is observed in the (EASEANP, LI) category, where the specific scores of the indexes are significantly distant from each other.

Table 9: Distribution of Variances of DODNIC, DSSNS & DM over region and income category

	Income Cat	DODNIC	DSSNS	DM
EASEANP	LI	1.25	0.856	0.416
	UMI	0.121	0.195	**0.0867**
	LMI	0.542	0.14	0.155
	HI	0.124	**0.0133**	0.238
ENCA	LI	NaN	NaN	NaN
	UMI	0.334	0.123	0.183
	LMI	0.372	0.186	0.199
	HI	**0.0436**	**0.087**	0.19
MENNA	LI	**0.0214**	**0.00378**	**0.0816**
	UMI	0.506	0.481	**0.0679**
	LMI	0.214	**0.0492**	**0.0653**
	HI	0.202	0.189	0.627
SSA	LI	0.447	0.339	**0.079**
	UMI	**0.077**	0.152	**0.0331**
	LMI	0.415	0.155	**0.0456**
	HI	NaN	NaN	NaN
NALANC	LI	NaN	NaN	NaN
	UMI	0.157	0.221	**0.0387**
	LMI	0.168	0.117	**0.0466**
	HI	**0.0836**	0.21	0.371

(Source: Author Calculation)

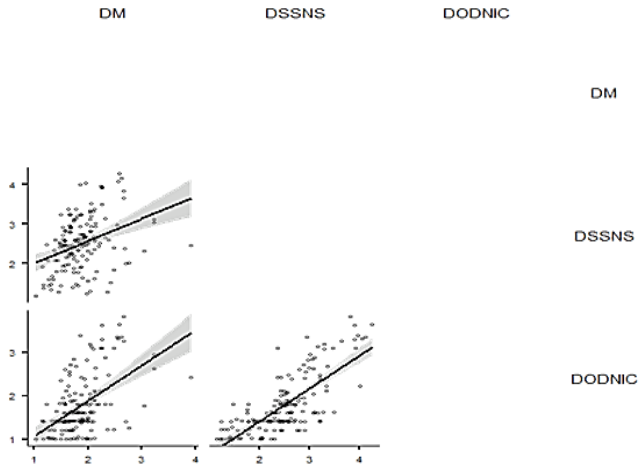
The Spearman rank correlation coefficients between DODNIC, DSSNS, and DM are presented in Table-10 and Figure-2. All the rank correlation coefficient values are significant, indicating a positive correlation between the indices. The rank correlation between DODNIC and DSSNS explains approximately 71 percent of the correlations between them, while between DODNIC and DM, it explains 48.3 percent, and between DSSNS and DM, it explains 37.1 percent.

If we include the Peace Index Score (PIS) with these indices, the Spearman rank correlation coefficient is expected to be higher, as PIS is constructed from DODNIC, DSSNS, and DM. The study observes the correlation between PIS and DODNIC, DSSNS, and DM separately as 0.881, 0.901, and 0.583, respectively, as expected, as shown in Table-11.

Table 10: Spearman Correlation Coefficient between Indices (without PIS)

		DM	DSSNS	DODNIC
DM	Spearman's rho	—		
	p-value	—		
DSSNS	Spearman's rho	0.371	—	
	p-value	< .001	—	
DODNIC	Spearman's rho	0.483	0.710	—
	p-value	< .001	< .001	—

Note. H_a is positive correlation



(Source: Author Calculation)

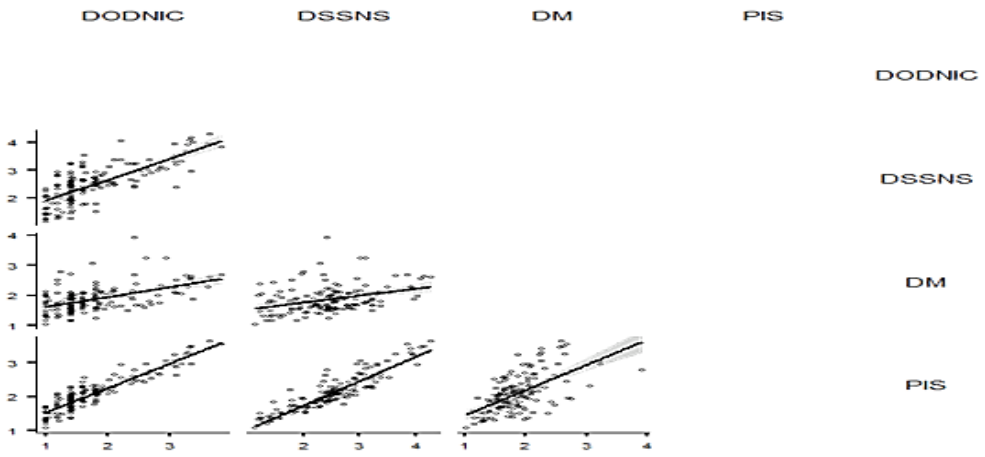
Figure 2: Spearman Correlation Coefficient between Indices (without PIS)

The graphical representation of the correlation between PIS and DODNIC, DSSNS, and DM is displayed in Figure-3. Careful observation of the values of index scores across countries reveals that the index scores are positively correlated with each other to some extent. This implies that there are some associations between DODNIC, DSSNS, and DM, whether in the presence or absence of PIS.

Table 11: Spearman Correlation Coefficient between Indices (with PIS)

		DODNIC	DSSNS	DM	PIS
DODNIC	Spearman's rho	—			
	p-value	—			
DSSNS	Spearman's rho	0.710	—		
	p-value	< .001	—		
DM	Spearman's rho	0.483	0.371	—	
	p-value	< .001	< .001	—	
PIS	Spearman's rho	0.881	0.901	0.583	—
	p-value	< .001	< .001	< .001	—

(Source: Author Calculation)



(Source: Author Calculation)

Figure 3: Spearman Correlation Coefficient between Indices (without PIS)

After examining the correlation among the background indices of PIS, the study sought to assess the reliability of DODNIC, DSSNS, and DM scores. The reliability analysis was conducted using scale reliability statistics and item reliability statistics. The scale reliability statistics presented in Table-12 indicate that both the values of Cronbach's α and McDonald's ω are above 0.6, suggesting the overall reliability of all three index scores. Simultaneously, the item reliability scores show that Cronbach's α is greater than 0.6 for DM and DSSNS but not for DODNIC, whereas McDonald's ω is greater than 0.5 for all three indices. In light of these findings, the study confirms that all three indices are generally reliable for estimating PIS. The reliability analysis also generated a correlation heat map, as shown in Figure-4, which estimates the Pearson correlation between DODNIC, DSSNS, and DM.

Table 12: Scale & Item Reliability results of DODNIC, DSSNS & DM

Scale Reliability Statistics

	mean	sd	Cronbach's α	McDonald's ω
scale	2.05	0.495	0.783	0.811

Item Reliability Statistics

				if item dropped	
	mean	sd	item-rest correlation	Cronbach's α	McDonald's ω
DODNIC	1.78	0.664	0.794	0.494	0.531
DM	1.87	0.422	0.471	0.860	0.860
DSSNS	2.50	0.661	0.685	0.639	0.683

(Source: Author Calculation)

(Source: Author Calculation)

Figure 4: Correlation Heat map between DODNIC, DSSNS & DM

The variation of these three background index scores of PIS across different country regions and income categories is a significant factor. Given that each of these three index scores is composed of distinct variables, the study aims to estimate one (DODNIC) based on DSSNS and DM through linear regression. In this regression analysis, two factors, namely country region and country income classification, are used as regression factors. As previously mentioned, there are five regional factors and four income categories.To begin, the study considers the EASEANP region and LI income category as the reference levels. The regression results of DODNIC on DSSNS and DM are presented in Table 13.

Table 13: Regression Results of DODNIC on DSSNS and DM

Table-13(A): Model Fit Measures

				Overall Model Test			
Model	R	R^2	Adjusted R^2	F	df1	df2	p
1	0.863	0.746	0.731	49.8	9	153	< .001

Table-13(B): Omnibus ANOVA Test

	Sum of Squares	df	Mean Square	F	p
DSSNS	17.446	1	17.446	147.07	< .001
DM	1.537	1	1.537	12.96	< .001
Country region	6.352	4	1.588	13.39	< .001
Income Category	0.973	3	0.324	2.73	0.046
Residuals	18.149	153	0.119		

Note. Type 3 sum of squares

Table-13(C): Model Coefficients – DODNIC (considering EASEANP Region & LI Income Category)

Predictor	Estimate	SE	t	p
Intercept ᵃ	-0.5218	0.2165	-2.41	0.017
DSSNS	0.815	0.0672	12.127	< .001
DM	0.2742	0.0762	3.6	< .001
Country region:				
ENCA – EASEANP	-0.0145	0.0928	-0.157	0.876
MENNA – EASEANP	0.1083	0.1113	0.973	0.332
SSA – EASEANP	-0.2965	0.0946	-3.133	0.002
NALANC – EASEANP	-0.555	0.1085	-5.118	< .001
Income Category:				
UMI – LI	-0.2161	0.1005	-2.149	0.033
LMI – LI	-0.0627	0.0915	-0.686	0.494
HI – LI	-0.0346	0.1311	-0.264	0.792

ᵃ Represents reference level

Table-13(D): Model Coefficients - DODNIC (considering ENCA region & LMI income category)

Predictor	Estimate	SE	t	p
Intercept ᵃ	-0.599	0.1938	-3.091	0.002
DSSNS	0.815	0.0672	12.127	< .001
DM	0.2742	0.0762	3.6	< .001
Country region:				
EASEANP – ENCA	0.0145	0.0928	0.157	0.876
MENNA – ENCA	0.1228	0.1009	1.218	0.225
SSA – ENCA	-0.2819	0.0957	-2.947	0.004
NALANC – ENCA	-0.5405	0.0926	-5.838	< .001
Income Category:				
LI – LMI	0.0627	0.0915	0.686	0.494
UMI – LMI	-0.1533	0.0812	-1.888	0.061
HI – LMI	0.0281	0.1058	0.266	0.791

ᵃ Represents reference level

Table-13(E): Model Coefficients - DODNIC (considering MENNA region & UMI income category)

Predictor	Estimate	SE	t	p
Intercept ᵃ	-0.63	0.2244	-2.806	0.006
DSSNS	0.815	0.0672	12.127	< .001
DM	0.274	0.0762	3.6	< .001
Country region:				
EASEANP – MENNA	-0.108	0.1113	-0.973	0.332
ENCA – MENNA	-0.123	0.1009	-1.218	0.225
SSA – MENNA	-0.405	0.1107	-3.655	< .001
NALANC – MENNA	-0.663	0.1104	-6.009	< .001
Income Category:				
LI – UMI	0.216	0.1005	2.149	0.033
LMI – UMI	0.153	0.0812	1.888	0.061
HI – UMI	0.181	0.0916	1.982	0.049

ᵃ Represents reference level

Table-13(F): Model Coefficients - DODNIC (considering SSA region & HI income category)

Predictor	Estimate	SE	t	p
Intercept ᵃ	-0.8528	0.1675	-5.091	< .001
DSSNS	0.815	0.0672	12.127	< .001
DM	0.2742	0.0762	3.6	< .001
Country region:				
EASEANP – SSA	0.2965	0.0946	3.133	0.002
ENCA – SSA	0.2819	0.0957	2.947	0.004
MENNA – SSA	0.4048	0.1107	3.655	< .001
NALANC – SSA	-0.2586	0.1042	-2.48	0.014
Income Category:				
LI – HI	0.0346	0.1311	0.264	0.792
UMI – HI	-0.1815	0.0916	-1.982	0.049
LMI – HI	-0.0281	0.1058	-0.266	0.791

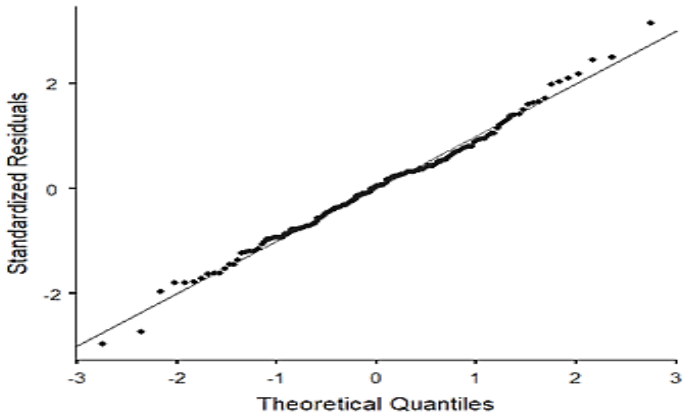
ᵃ Represents reference level

Table-13(G): Model Coefficients - DODNIC (considering NALANC region & HI income category)

Predictor	Estimate	SE	t	p
Intercept [a]	-1.0768	0.2441	-4.411	< .001
DSSNS	0.815	0.0672	12.127	< .001
DM	0.2742	0.0762	3.6	< .001
Country region:				
EASEANP – NALANC	0.555	0.1085	5.118	< .001
ENCA – NALANC	0.5405	0.0926	5.838	< .001
MENNA – NALANC	0.6633	0.1104	6.009	< .001
SSA – NALANC	0.2586	0.1042	2.48	0.014
Income Category:				
UMI – LI	-0.2161	0.1005	-2.149	0.033
LMI – LI	-0.0627	0.0915	-0.686	0.494
HI – LI	-0.0346	0.1311	-0.264	0.792

[a] Represents reference level

Q-Q Plot



Source: Author Calculation

Figure 5: Q-Q Plot

The overall regression of DODNIC on DSSNS and DM is described in Table 13 and its sub-tables. The regression results in Table 13(A) show that R2 and Adjusted R2 explain the model at a level of more than 73 percent. The value of the F-statistic is significant, confirming the overall validity of the regression equation. The Q-Q plot further reaffirms the normality of the distribution. In Table-13(B), the results of ANOVA are presented, confirming that, except for the income category factor, all parameters, such as DSSNS and DM, as well as the considered factor of country region, are significant in influencing the index scores of DODNIC. Additionally, the study notes that if we regress DSSNS on DODNIC and DM, the country's income status becomes significant along with the country region (Table-14). Therefore, considering these factors, the main purpose of the study is to observe the variation in background index scores with changes in country region and country income status. To achieve this, the study introduces variations in the reference level within the same regression model (DODNIC on DSSNS and DM).

Table 14: ANOVA Results of Regression of DSSNS on DM and DODNIC

Omnibus ANOVA Test

	Sum of Squares	df	Mean Square	F	p
DM	0.0699	1	0.0699	0.799	0.373
Country region	6.243	4	1.5607	17.829	< .001
Income Category	5.1964	3	1.7321	19.787	< .001
DODNIC	12.8744	1	12.8744	147.07	< .001
Residuals	13.3932	153	0.0875		

Note. Type 3 sum of squares

(Source: Author Calculation)

In this regression, the t-values of DSSNS and DM are found to be significant, which is as expected. The level of multicollinearity (VIF) and the degree of autocorrelation (DW-statistic) are found to be insignificant here. In Table-13(C), the study considered the EASEANP region and LI income group as the reference level. The study notes that the EASEANP region reference level only influences the NALANC region, whereas the LI income group countries' reference level fails to influence other income groups. Based on these results, it is not possible to confirm whether EASEANP influences NALANC countries or vice versa. To

confirm such causal relationships, the study conducted iterations by changing the reference level of factors. Table-13(D) displays the combination of the reference level between the ENCA region and LMI income group countries. The study found that the relationship between NALANC and the ENCA region is significant, confirming that NALANC region countries' scores may have some influence over others. This is reaffirmed by Table-13(G), where the index scores between EASEANP-NALANC, ENCA-NALANC, and MENNA-NALANC regions are significant.

In an overall sense, when regressing index scores of DODNIC on DSSNS and DM index scores, if the scores of the NALANC region are used as a general reference for others, they influence other country regions except the SSA region. Similarly, if the MENNA region or the SSA region is used as the reference level, the index scores of one will influence the scores of the other. Thus, the country's regional status is found to have some impact on distributing the index scores across countries, while the income status of the countries remains insignificant.

IV. CONCLUSION

Based on these observations, the study concludes that the construction of the PIS depends on the three background indices, all of which are strongly correlated with each other. The results indicate that the income classifications of the country do not influence the index scores significantly; rather, the variables selected for constructing the index are of greater importance. In today's world, where regions are influenced by complex international relationships between countries, regional dynamics can be a significant factor in determining these index scores. The study's results reaffirm that regional context is a significant factor in the interrelationships between such index scores.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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