

## Relationship Between Competitiveness and Social Progress Indicators

<sup>1</sup>Joel Pereira Munhoz Junior, <sup>2</sup>Luciano Luiz Dalazen, <sup>3</sup>Luciana Santos Costa Vieira da Silva, <sup>4</sup>Bruno Nogueira Silva, <sup>5</sup>Joyce Silva Soares de Lima, <sup>6</sup>Robson de Faria Silva, <sup>7</sup>Fabíola Kaczam

<sup>1</sup>Master in Business Administration from the Pontifical Catholic University of Paraná (PUCPR) Professor at UniFael University Center, Brazil

<sup>2</sup>Doctor in Administration Pontifical Catholic University of Paraná PUCPR, Brazil

<sup>3</sup>Scholarship holder FAPESQ-PB

Post-Doctoral Student at the Federal University of Paraíba (UFPB), Brazil

<sup>4</sup>Master's student in Business Administration at the Federal Rural University of the Semi-Arid – (UFERSA), Brazil

<sup>5</sup>Master's student in Business Administration at the Federal Rural University of the Semi-Arid -UFERSA, Brazil

<sup>6</sup>Doctoral degree in Administration Pontifical Catholic University of Paraná PUCPR, Professor at Higher Education Center - CESUL, Brazil

Scholarship holder DS/Capes

Doctoral Student of the Postgraduate Program in Administration at Federal University of Santa Maria - UFSM, Brazil

### Abstract

This research aims to evaluate the existence of empirical evidence on the relationship between the competitiveness index and the social progress index of the countries considered in the sample in the year 2019. To this end, we use indicators that seek to portray in detail their methodologies found in the “Report Social Progress Index”, published in 2019 and in “The Global Competitiveness Report”. The investigated population refers to all countries included in the WEF (World Economic Forum) ranking and those countries included in the IPS (Social Progress Index) ranking in 2019, making a total of 151 and 133 countries, respectively. The sample used refers to 133 countries that had complete data in both databases. The analysis methods used were Exploratory Factor Analysis and the Root Cause function. Empirical results suggest that social convergence reflects the way in which economic performance produces asymmetries in the income distribution of the researched nations, guaranteeing access to certain goods and services considered relevant to the quality of life in order to ensure security functions. facing certain risks. It was found that this work is in line with the findings developed by (Arruda et al., 2009), with regard to the relationship between the competitiveness index and the Gross Domestic Product (GDP) and its main contribution is to be able to provide subsidies to public policy makers when considering competitiveness indicators as beacons for improving the quality of life and social progress of the analyzed nations.

**Key-Words:** Competitiveness; Social Progress, Indicators

### 1 Introduction

Competitiveness can be seen at three different interrelated levels: the national level, the industry level and the company level (Edwards et al., 1999). All definitions are quite similar, and among them they have a common sense that creates a favorable environment for the development of a better state and the well-being of individuals.

Porter (1990) sticks to the definition of competitiveness in a broader and more complex sense, so that competitiveness is conceptualized as the relative position of a country vis-à-vis its competitors. In this sense, the relative position mentioned by Porter (1990) concerns the discussion of the performance of economies in

a sense of benchmarking, in order to identify areas of the economy that are less developed, regardless of the reasons that led them to do so.

Today competition has at stake the economic strength of a country, an industry or a company that are competitors in the global market economy in which goods, services, people, skills and ideas circulate freely across borders (Nazari, 2013).

Due to competitiveness being borderless, markets have become dynamic and possibilities limited to the ability of the competitor. The new technology companies allied to the ability to overcome the lack of inputs for production, seek through the discovery of new production methods, achieve sustainable competitiveness (Sautter & Leisen, 1999).

Schwab & Porter (2007) defines competitiveness as a set of attributes and qualities of an economy that allow a more efficient use of production factors. However, many of the indices (Human Development Index, Global Competitiveness Index, Environmental Performance Index, etc.) or even the traditionally used indicator, GDP, is not able to offer a holistic picture of sustainable economic performance and development countries (Popescu et al., 2017; Uslu et al., 2020).

In this context, the competitiveness is seen as a static view where a picture is taken and the present situation is analyzed with economic and social indicators. On the other hand, it is important to understand social progress, which can be interpreted as society's ability to meet people's humanitarian needs, build a foundation for individual citizens and communities to maintain and improve the quality of life and create conditions under which everyone can meet their urgent needs (Rajnoha et al., 2021).

Heyets (2021) says that the Social Progress Index is based on non-economic dimensions of social activities in terms of: provision of access to basic knowledge, information, communication, health and ecosystem sustainability, which together constitute the basis of well-being and realization of opportunities (in terms of personal rights) for personal freedom and choice, tolerance and integration, as well as expanded education. Based on the conjectures described above, the research question can be described as follows: What is the relationship between competitiveness indicators and social progress indicators?

It should be noted that country indices and classifications have been generated taking into account a hundred variables and the most diverse methodologies. Due to the variety of indices, it is not known for sure which ones best represent reality, since the methodological processes published in the reports issued by the responsible institutions are devoid of detail and precision. This analysis is valuable for decision makers or investors seeking to recognize countries that can provide better investment results depending on the macroeconomic scenario.

Thus, it is evident that competitiveness in terms of economic development and social progress are increasingly current. New knowledge of the interrelationship between these fields can bring new insights into economic and social trends. In the Web of Science database scientific articles were found that address the subject with macroeconomic aggregates, but do not deal with the subject in a joint way. Given this context, the objective of the work is to relate the indicators of competitiveness with the indicators of social progress, both bases, recognized in the academic environment.

The main contribution of this research lies in the fact that it provides subsidies to public policy makers when considering competitiveness indicators as indicators of improving the quality of life and social progress of the analyzed nations, allied to the fact of determining which competitiveness indexes most influence the social progress.

The work is structured in five sections, namely: the first section concerns the introductory part of the research; the second refers to the empirical theoretical foundation; the third deals with the methodological procedures used in the work; the fourth deals with the presentation and analysis of the results and the fifth refers to final considerations, limitations and recommendations for future research.

## **2 Theoretical Background**

Competitiveness is a widely studied concept that has caused a lot of controversy among authors because there is no convincing theory or accepted definition about it. Despite this, several definitions have been constructed over the years. However, most of these definitions refer competitiveness to the ability of organizations to compete with their rivals (Sierra-Altamiranda et al., 2020).

New economic perspectives were later added to the concept of comparative advantage Krugman (1991); Morck et al. (2000); Moreno et al. (2021), political Barro (1991); Larrain (2001). Social Kogut (1991); McArthur & Sachs (2001), religious (Weber, 1905), cultural (Donaldson, 2001; Hofstede & Bond, 1988) and

institutional de Melo et al. (2019); Snowdon & Vane (2005), where later they were integrated into the Competitive Diamond model, which sought to explain which factors influenced the competitiveness of nations in specific industries (Porter, 1990).

Smith (1996), when he published his book "Wealth of Nations" in 1776, developed the theory of absolute advantages as the basis of international trade. The absolute advantage of a country in the production of a good results from greater productivity, that is, from the use of a smaller amount of input to produce that good at lower costs. He points out that it is not always necessary for a country to obtain a foreign trade surplus for international trade to be advantageous, and that voluntary exchanges between countries can benefit everyone involved in the operation (Sossa & Duarte, 2019).

The competitiveness of nations according to Krugman (1994); Porter, (1990); Sala-I-Martin et al. (2007) comprises a broad construct covering social, cultural and economic variables, related to the ability of a country to create and maintain an environment conducive to the creation of value by its companies, which allow the achievement of increasing returns to its resources, influencing the quality of life of its citizens.

The concept of competitiveness influences a country's productivity and clearly determines its ability to sustain a high level of income, it is also one of the central determinants of investment returns, which is one of the main factors that explain an economy's growth potential (Porter, 2009). In addition, the sustainability of a nation's prosperity is also only guaranteed if its productivity is maintained (SALA-I-MARTIN et al., 2007).

Nations do not necessarily compete with each other, but companies do so in the international market (Hermida & Xavier, 2018). In this sense, the competitiveness of nations is greatly different from the competitiveness of companies. The latter, in the absence of competitiveness, tend to the unsustainability of their businesses or bankruptcy. Nations do not have a well-defined concept of bankruptcy and, regardless of their macro or microeconomic conditions, they continue to exist and seek new positions in the international market (Krugman, 1996). Schwab & Porter (2007) complement by considering that macroeconomic aspects are complemented by microeconomic aspects.

The literature on competitiveness underlines the links between country and company levels (Hermida & Xavier, 2018). For example, some studies claim that countries can only increase their competitiveness if companies are competitive (Sossa & Duarte, 2019).

Rugman et al. (2012), indicate that competitiveness emerges at the intersection of the dimensions of the country and the company. They argue that competitiveness is determined by the interactions between a firm's "specific capabilities" or "firm-specific advantages" and the assets of the country in which the firm conducts its activities or "country-specific advantages" (Rugman et al., 2012).

According to the (OECD, 2015), competitiveness is the set of institutions, policies and factors that determine a country's level of productivity. The level of productivity, in turn, defines the level of sustainable prosperity that can be achieved by an economy. In other words, more competitive economies tend to be able to produce higher levels of income for their citizens.

Thus, as it has different meanings and there is no consensus on the definition of competitiveness, Marques et al. (2018) suggest that competitiveness is a relative concept and a multidimensional phenomenon. Therefore, its analysis requires defining the context and the indicators used for its measurement, which must be carefully selected.

With regard to competitiveness indicators, these serve, firstly, as a comparative basis between regional and national economies and secondly, they indicate possible guidelines for international trade, considering that when using the same indicators for the analyzed regions, it is possible to identify which economies emerged more competitive over the period studied (Croes & Kubickova, 2013).

Stauvermann & Kumar (2017) complement by informing that competitiveness indicators also apply to companies, allowing the measurement of aspects that allow them to maintain a competitive advantage over their competitors.

Research on strategic trade/industrial policy published during the 1980s Diebold & Krugman (1986); Lall (2001); Spencer & Brandner (2008) seemed to suggest that countries could increase their well-being by attaining leadership positions of market in sectors characterized, for example, by high economies of scale, from the use of targeted government support. Other research has questioned the social benefits of such profit shifting policies (Krugman, 1994; Porter, 1990).

Another view of competitiveness focuses on measures related to the costs of a location. The work on cost competitiveness has several interpretations. Low wage costs (pay per hour, per employee) are seen as a sign

of competitiveness leading to decreased unemployment, increased exports. Other studies examine the relationship between (labor) and exit costs. Unit labor costs are often used to assess whether a country's balance of payments is likely to be sustainable (European Central Bank, 2008).

From this perspective, competitiveness becomes closely linked to productivity. This is validated by a vast literature that has identified productivity as the central driver of differences between countries in terms of prosperity (Hall & Jones, 1999; Lewis, 2004). Several sets of factors have been proposed to explain differences between countries in terms of productivity (Borsatto & Bazani, 2021; Fagerberg et al., 2007; Hall & Jones, 1999; Liu et al., 2021).

Regarding the Social Process Index, it was developed by Porter, Stern & Green (2014) and seeks to meet the need to create a holistic and robust measurement model that measures the social and environmental performance of nations (Romanello, 2021). This indicator can be used as a tool by companies, government and other entities to indicate the success and ills of their actions (Porter et al., 2014).

For Ghazaoui (2021), despite not being the first structure used to measure the development of a nation, this index is considered the most recent tool to measure the progress of a nation.

Finally, the social progress envisioned by Manea et al. (2021); Porter et al., (2014) can be seen as the ability to meet the basic human needs of society, establishing basic components that allow improving and maintaining the quality of life of those involved, as well as creating conditions for everyone to reach their full potential.

### **3. Methodology**

#### **3.1 Research Characterization**

This research can be characterized as a descriptive, quantitative and relational study because it uses metrics of a statistical nature in order to unravel the relationship between indicators of competitiveness and indicators of social progress.

Regarding the time issue regarding data collection, this study concerns a cross-sectional research because it is carried out in a short period of time and is carried out when there is a limit of time or resources and the data are collected only once, before being analyzed and reported (Collis & Hussey, 2005).

#### **3.2 Collection and Treatment of Data**

The population studied refers to all countries included in the WEF (World Economic Forum) ranking and those countries included in the IPS (Social Progress Index) ranking in 2019, making a total of 151 and 133 countries, respectively, segmented by the countries of the continents of the world, namely: America, Africa, Asia, Europe and Oceania. The countries of Oceania were included together with those of Asia, as they demonstrate geographic proximity and similar performance in relation to the indicators analyzed.

The sampling process was of the non-probabilistic accessibility type, where it sought the countries that were in the two bases, without the lack of any indicator, reaching the final sample of 133 analyzed countries, so that the researcher is able to draw consistent conclusions, without extrapolating your results. Secondary data were collected from the WEF website and Index Progress database, and were treated with the help of SPSS (Statistical Package for the Social Sciences), XLStat and Statistica for Windows software. The database available at the World Economic Forum brings a total of 151 countries that participate in the Competitiveness ranking, arranged in 12 major pillars.

The analyzes were carried out using descriptive statistics metrics, Exploratory Factor Analysis (EFA), used in the estimation of factors or dimensions, in addition to the Root Cause function, which is a non-parametric method used to assess the causal relationship between the indicators of competitiveness and social progress.

### **4. Results and Discussion**

#### **4.1 Descriptive Data Analysis**

Based on the evaluation of the data collected, it appears that most countries belong to the European continent, with approximately 32% of the total sample evaluated, while the smallest part refers to the American continent.

The Figure 1 show the countries that ranked higher in both the social progress index ranking and the competitiveness index ranking.



Fig. 1 – Top Rankings in terms of Social Progress and Competitiveness Indices



Source: The Authors, 2019.

Based on Figure 1, it can be seen that when evidencing the averages of the Social Progress Indices (IPS) with the averages of the Competitiveness Index (CI), it is verified that the three best ranked countries in each continent are arranged in a percentage equal to 10.05% in relation to the total number of countries considered in the sample where they belong: a) America – Green: United States, Canada and Uruguay; b) Africa – Red – Mauritius, South Africa and Botswana; c) Asia-Blue: Australia, New Zealand and Japan; d) Europe – Light Green: Norway, Switzerland and Sweden.

The countries with the worst rankings, both in the IPS ranking and in the IC ranking, as shown in Figure 2.

Fig. 2 - Worst Rankings Regarding Social Progress and Competitiveness Indices



Source: The Authors, 2019.

Notice in Figure 2, that when showing the averages of the Social Progress Indices (IPS) as well as the averages of the Competitiveness Index (CI), the three countries that were evidenced as the worst classified are: America – Wine: Haiti, Honduras and Guyana; Africa – Red: Guinea, Ethiopia and Chad; Asia-Blue: Laos, Myanmar and Pakistan and Europe - Rocha: Russia, Moldova and Tunisia.

Descriptive statistics were estimated, namely: minimum, maximum, mean, standard deviation and coefficient of variability. The results for the descriptive statistics of the Social Progress Index are shown in Table 1.

Table 1 - Descriptive Analysis of the Social Progress Index

Social Progress Index	Minimum	Maximum	Average	Standard deviation	Variability Coefficient
1. Nutrition and Basic Medical Care	37.780	99.580	88.100	14.270	16.20%
2. Personal Security (PS)	24.030	93.570	64.070	17.396	27.15%
3. Access to Basic Knowledge (ABK)	30.720	99.970	86.595	14.453	16.69%
4. Health and Wellness (HW)	40.590	81.080	67.896	8.422	12.40%
5. Ecosystem Sustainability (ES)	27.150	82.210	52.965	12.125	22.89%
6. Individual Rights (IR)	4.640	98.840	57.035	24.617	43.16%
7. Individual Freedoms (IF)	25.080	91.540	63.439	14.173	22.34%
8. Tolerance and Inclusion (TI)	18.660	89.540	53.749	15.143	28.17%
9. Access to Higher Education (AHE)	4.550	89.470	44.178	20.703	46.86%
10. Housing (H)	19.660	92.250	65.521	19.178	29.27%
11. Water and Sanitation (WS)	16.350	100.000	76.303	24.739	32.42%
12. Access to Information and	27.690	96.110	70.324	15.623	22.22%

Source: The Authors, 2019.

From the results shown in Table 1, it can be seen that the estimate for the global average was equal to 65.848, considering a measurement scale that ranges from 0 to 100, while the standard deviation was around 16.737, and the Variability coefficient was equal to 26.65%, which in the view of Martins & Domingues (2017) is considered as a dispersion mean, being interpreted as a representativeness for the arithmetic mean as a measure of position is just a regular measure of relative variability.

It is also noted that the indicators with the highest averages were those of nutrition and basic medical care, whose value was equal to 88.10 and, on the other hand, access to basic knowledge, where the value was equal to 44.18.

In relation to the standard deviation, a greater uniformity is perceived, that is, smaller values for the standard deviation that demonstrate a smaller variation around the average, in the data collected, especially for the variable Health and well-being with a value equal to 8.422 in the other hand, there was a greater variation in the Water and Sanitation Indicator with a standard deviation of 24.739, which shows a greater variation in the data collected, demonstrating a greater deficit in some of the countries in the sample. The results for the descriptive statistics of the Social Progress Index are shown in Table 2.

Table 2 - Descriptive Analysis of Competitiveness Index

Competitiveness Index	Minimum	Maximum	Average	Standard deviation	Variability Coefficient
1. Business Sophistication (BS)	2.769	5.821	4.080	0.695	17.04%
2. Infrastructure (INFRA)	1.667	6.540	4.025	1.211	30.09%
3. Higher Education and Training (EST)	2.047	6.216	4.236	1.022	24.13%
4. Institutions (INS)	2.147	6.089	3.996	0.855	21.39%
5. Innovation (INO)	2.249	5.783	3.476	0.837	24.07%
6. Commodity Market Efficiency (CME)	2.777	5.641	4.364	0.531	12.16%
7. Technological Availability (TA)	2.067	6.365	3.983	1.174	29.48%
8. Macroeconomic Environment (ME)	2.423	6.835	4.759	0.976	20.51%
9. Health and Primary Education (HPE)	2.716	6.887	5.505	0.935	16.99%
10. Labor Market Efficiency (LME)	2.553	5.750	4.196	0.550	13.11%
11. Financial Market Development (FMD)	2.372	5.836	4.052	0.731	18.05%
12. Market Size (MS)	1.297	6.935	3.831	1.148	29.95%

Source: The Authors, 2019.

From the results shown in Table 2, it can be seen that the estimate for the global average was equal to 4.20, considering a measurement scale that ranges from 0 to 7, while the standard deviation was around 0.89, and the average of the coefficient of variability was equal to 21.41%, which in the view of Martins & Domingues (2017) is considered as a dispersion average, which can be interpreted as a representativeness for the arithmetic average as a measure of position is regular just from the relative variability.

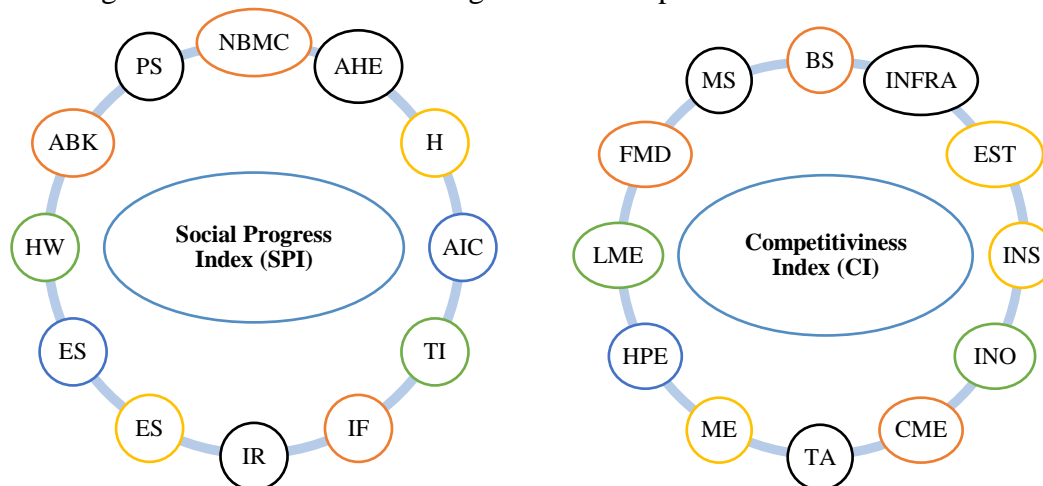
It is also noticed that the indicators with the highest averages were those referring to health and primary education, where the value was equal to 5.51 and, on the other hand, the Innovation indicator, obtained a value equal to 3.48.

Regarding the standard deviation, there is greater uniformity, that is, smaller values for the standard deviation that demonstrate a smaller variation around the average, in the data collected, mainly for the variable Efficiency of the Merchandise Market with a value equal to 0.55 on the other hand, there was a greater variation in the Infrastructure Indicator with a standard deviation of 1.21, which shows us a greater variation in the data collected, demonstrating a greater deficit in some of the countries in the sample.

#### 4.2 Estimate of Exploratory Factor Analysis

In order to analyze the constructs defined in indices of social progress (IPS) and competitiveness (CI) and their respective items that were coded as shown in the previous tables, the exploratory factor analysis technique was used, since there is no still has a previous underlying theory or even sufficient empirical evidence to explain how the items of the factors researched should be grouped and evaluated, in addition to the fact that it seeks to confirm or even refute the factor structure (Brown, 2006), as it is arranged. in Figure 3.

Fig. 3 - Structure of Social Progress and Competitiveness Indices Factors



Source: The Authors (2019)

The reference values for the KMO are as follows: values lower than 0.50 are considered unacceptable; values between 0.5 and 0.7 are considered mediocre; values between 0.7 and 0.8 are considered good; values between 0.8 and 0.9 are considered excellent and excellent, respectively (Hutcheson & Sofroniou, 1999).

In the case of Bartlett's sphericity test, it assesses the overall significance of all correlations in a data matrix. In this sense, probability values lower than 5%, that is,  $p < 0.05$ , indicate that the matrix is factorable (Tabachnick & Fidell (2007)), thus rejecting the null hypothesis that the data matrix is similar to an identity matrix.

Table 3 shows the estimation of the KMO adequacy measure and Bartlett's sphericity test for the social progress indicator.

Table 3 - Estimate of KMO and Bartlett's Sphericity

KMO and Bartlett Test - Social Progress Index		
Kaiser-Meyer-Olkin measure of sampling adequacy		0.909
Bartlett's sphericity test.	Chi-square approx	1551.393
	Df	66

	Sig. (p-value)	0.000
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Source: The Authors, 2019

Based on the estimates of the tests in Table 3, it can be seen that the KMO measure was equal to 0.909, which demonstrates an excellent suitability for the use of exploratory factor analysis. In relation to Bartlett's sphericity test, a probability value equal to zero (p-value = 0.000) was found, thus rejecting the null hypothesis that the (co)variance matrix is similar to an identity matrix, that is, the main diagonal is equal to one and the other elements of the matrix are close to zero.

The results for estimating the KMO adequacy measure and Bartlett's sphericity test for the competitiveness indicator are shown in Table 4.

Table 4 - Estimate of KMO and Bartlett's Sphericity

KMO and Bartlett Test - Competitiveness Index		
Kaiser-Meyer-Olkin measure of sampling adequacy		0.895
Bartlett's sphericity test	Chi-square approx.	1668.567
	Df	36
	Sig. (p-Value)	0.000

Source: The Authors, 2019.

Based on the estimates of the tests mentioned above in Table 4, it can be seen that the KMO measure was equal to 0.895, which demonstrates an excellent suitability for the use of exploratory factor analysis. Regarding Bartlett's sphericity test, a probability value equal to zero was found, that is, (p-value = 0.000), thus rejecting the null hypothesis that the (co)variance matrix is similar to an identity matrix, that is, the main diagonal is equal to one and the other elements of the matrix are close to zero.

Once it was found that the use of exploratory factor analysis is suitable for the set of data collected, the next step refers to evaluating the retention of the underlying factors, based on the criterion defined by Kaiser-Guttman, better known as eigenvalue > 1 (Patil et al., 2008). In this case, each retained factor has an eigenvalue that refers to the total variance explained by this factor.

The objective of factor rotations is, therefore, to find a solution that is as simple and interpretable as possible, where each variable or item presents a high factor loading in a few factors or in only one of them, according to (Abdi, 2003).

To extract the underlying factors for the competitiveness indicator, the varimax orthogonal rotation method was used, which aims to facilitate the interpretation of factors, given that several times the variables or items analyzed present high factor loadings in more than one factor, in addition to the factors extracted to be considered independent of each other.

After verifying the adequacy of the sample to the exploratory factor analysis, Cronbach's Alpha coefficient was estimated, as well as the percentage of explained variance of all items of the two factors analyzed (social progress index and competitiveness index), evaluating the loading of all items and establishing as a cut-off point values below 0.40 to be excluded from the indicators of social progress and competitiveness, as can be seen in Table 5.

Table 5 - Exploratory Factor Analysis of Social Progress and Competitiveness Indices

Factors	Items	Loading	Explained Variance (%)	Cronbach's Alpha	KMO
Social Progress Index	1. Nutrition and Basic Medical Care	0.849	73.382	0.930	0.909
	2. Personal Security	0.567			
	3. Access to Basic Knowledge	0.844			
	4. Health and Wellness	<b>0.494</b>			
	5. Ecosystem Sustainability	<b>0.360</b>			
	6. Individual Rights	0.655			
	7. Individual Freedoms	0.818			
	8. Tolerance and Inclusion	0.762			
	9. Access to Higher Education	0.824			



	10. Housing	<b>0.885</b>			
	11. Water and Sanitation	<b>0.897</b>			
	12. Access to Information and	0.850			
<b>Competitiveness Index</b>	1. Business sophistication	<b>0.889</b>	77.275	0.941	0.895
	2. Infrastructure	<b>0.907</b>			
	3. Higher Education and Training	0.878			
	4. Institutions	0.874			
	5. Innovation	0.842			
	6. Commodity Market Efficiency	0.866			
	7. Technological Availability	0.861			
	8. Macroeconomic Environment	<b>0.287</b>			
	9. Health and Primary Education	0.727			
	10. Labor Market Efficiency	0.790			
	11. Financial Market Development	0.754			
	12. Market Size	<b>0.599</b>			

Source: The Authors, 2019.

Based on the results of Table 5, it can be seen that the social progress index with the highest load was “Water and Sanitation”, whose value was equal to 0.897, followed by the item “Housing” whose value was equal to 0.885. In contrast, the items with the lowest loads were “ecosystem sustainability” whose value was equal to 0.360 and the item “Health and well-being” whose value was equal to 0.494. It is noteworthy that the greater the factor loading, the greater the degree of correspondence between the item and the underlying factor and, consequently, its representativeness within the factor.

Evaluating the variance explained by the two underlying factors, it can be seen in the light of the previous table that the social progress indicator has a variance explained by all the items that make up the factor of approximately 73.382%, in addition to presenting a cronbach's alpha coefficient equal to 0.930, which shows a high internal consistency of the variables (items/questions).

It is worth noting that values close to unity, as estimated, the more accurate is the measuring instrument, thus verifying that the variance associated with random errors decreases. In this case, the results from the application of the final version of the research instrument will contribute with accurate, reliable and reality-related measurements, far from measurements related to random errors.

Still referring to the results in Table 5, the competitiveness index with the highest load was “Infrastructure” whose value was equal to 0.907, followed by the item “Business Sophistication” whose value was equal to 0.889. In contrast, the items with the lowest shipments were the “macroeconomic environment” whose value was equal to 0.287 and the item “market size” whose value was equal to 0.599. It is noteworthy that the greater the factor loading, the greater the degree of correspondence between the item and the underlying factor and, consequently, its representativeness within the factor.

Evaluating the variance explained by the two underlying factors, it can be seen in the light of the previous table that the social progress indicator has a variance explained by all the items that make up the factor of approximately 77.275%, in addition to presenting a cronbach's alpha coefficient equal to 0.941, which shows a high internal consistency of the variables (items/questions).

#### 4.3 Analysis of the Relationship Between Social Progress and Competitiveness Indicators

We sought to define, a priori, the degree of relationship between the items that make up the latent factor competitiveness index (independent variables) and the items that make up the social progress index (dependent variable) based on the estimation of the Root Cause Function.

The items that make up the competitiveness index were defined as independent variables, while the average of the items of the social progress index was defined as a dependent variable, supported by the work developed by Arruda et al. (2009) who noticed the existence of a “one-way” relationship between competitiveness indicators and the Gross Domestic Product of nations in that specific year.

According to Rohleder & Silver (1997), the Root Cause Function refers to a common approach used in quality improvement or process improvement in engineering areas. The context used in this tool involves the investigation of an effect of a given variable and the search for its true cause. Initially, several possible

causes are listed and the identification of the most likely causes is usually the result of a subjective and creative process that involves, for example, brainstorming.

Several researchers accept (Hume (1980) sequence principle, that causes precede effects. Reichenbach (2000) seeks to define causality without the question of sequential orderings, but recognizes that "(...) when we are asked how we distinguish cause from effect, we usually say that (...) the cause is what precedes the another in time".

This tool that enables the determination of the root cause, called Root Cause Analysis, according to Okes (2008) refers to an analytical process that requires rigorous analysis of the cause-effect relationship. In this sense, it can be seen as an essentially cognitive process where researchers are responsible for gathering and weighing evidence and proposing hypotheses even before drawing any conclusions.

The estimate for the Root Cause Function, considering the social progress index as the dependent variable and the 12 items of the competitiveness indicator as independent variables, can be seen in Table 6.

Table 6 - Root Cause Function with Social Progress Index as Dependent Variable

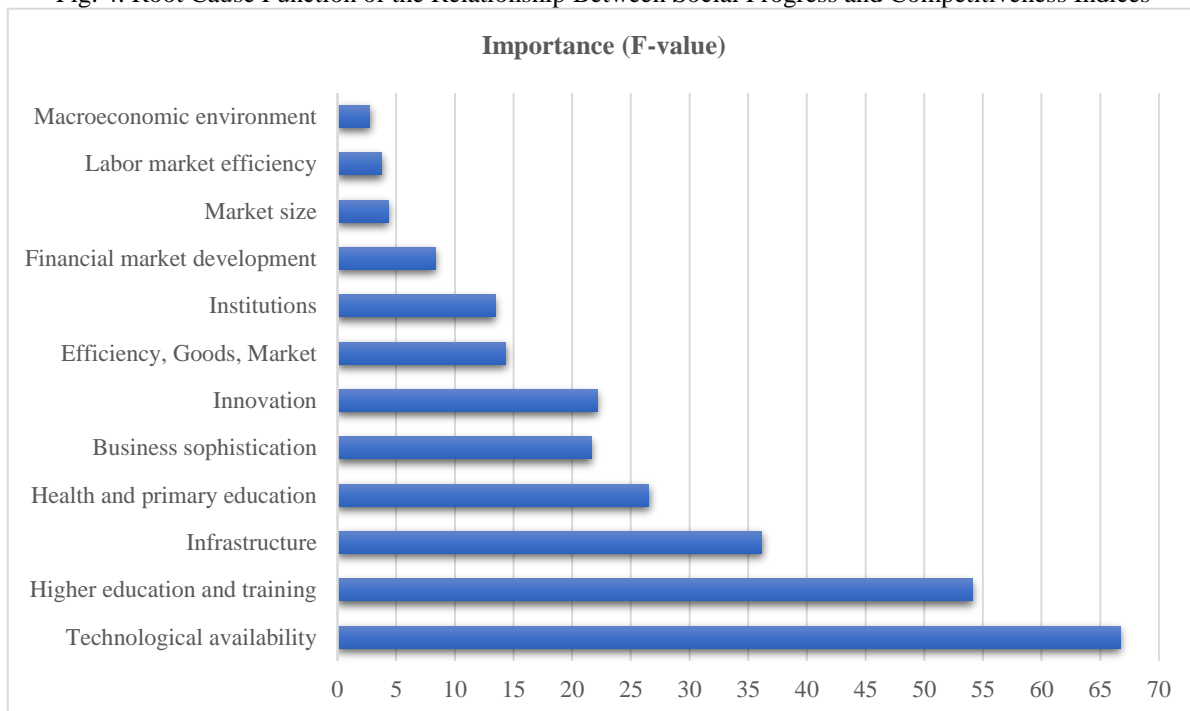
Competitiveness Index Items	Value-F	p-Value
Technological Availability	66.724	0.000
Higher Education and Training	54.084	0.000
Infrastructure	36.163	0.000
Health and Primary Education	28.003	0.000
Innovation	22.031	0.000
Business sophistication	21.548	0.000
Efficiency Goods Market	14.209	0.000
Institutions	13.292	0.000
Financial Market Development	8.015	0.000
Market Size	3.699	0.000
Labor Market Efficiency	3.388	0.001
Macroeconomic Environment	2.919	0.004

Source: The Authors, 2019.

It was noticed through the estimates arranged in Table 6, that all the items that form the underlying factor Competitiveness Index, have an impact on the social progress index, since the probability values (p-value) associated with the F-Fisher statistic were below the 5% significance level. Notably, the highest estimated values for the "F" statistic indicate a greater impact of the item on the social progress index.

In Figure 4 we show the graph of the Root Cause Function based on the estimates shown in the previous table.

Fig. 4. Root Cause Function of the Relationship Between Social Progress and Competitiveness Indices



Source: The Authors, 2019.

Based on Figure 4, it can be seen that the most relevant predictors are: Technological availability, with an F Statistic value equal to 66.72, Higher education and training, with an F Statistic value of 54.08 and Infrastructure, whose F-Statistic value equal to 36.16. It was also noticed that, in all cases, the probability value associated with the F Statistics were below 0.05, being considered statistically significant.

The results shown above lead to the realization that the competitiveness of countries is intrinsically related to the verification of social progress, whether in terms of economic performance, or in terms of improving living conditions, represented in this work by the indicators of social progress.

## 5. Final Considerations and Limitations

The processes related to competitiveness and social progress in the evaluated regions are associated with the process of economic and social growth, given that they are processes with a long-term horizon, extending over decades, this fact is due to stimuli influenced by different stages of economic growth.

Thus, social growth reflects the way in which economic performance produces asymmetries in the income distribution of the researched nations, which guarantees access to certain goods and services, considered relevant to the quality of life in order to ensure security functions. facing certain risks.

In fact, in order to detect an acceleration in the rhythms of economic and social development among nations, in order to lead to a virtuous and sustained process of territorial competitiveness and link between the economic and the social, it is important that the regions present as much an attractive number of occupied jobs, as well as a relatively high level of productivity, due to the importance of complementing the capacity to create jobs in such a way that it can mobilize the available human resources with the capacity to produce efficiently, which, translates into a combination of “greater” and “better” use of human resources.

The resulting product of this research referred to a ranking that relatively classifies these nations, based on the indices of social progress and competitiveness. This relationship had a single direction (one way), given that this assumption was relevant for the definition of the estimated equations. Thus, good conditions of competitiveness are ex-ante conditions for increasing social progress.

Even with the results of the Root Cause Function described above, the investigated indices are still good instruments for measuring the changes that have taken place in a country, in favor or against the improvement of the competitive environment. Better methodological adequacy is needed, so that these same indexes can be widely used by the business and academic community.

Regarding the research question stated as: is there empirical evidence of the relationship between the competitiveness indicator and the social progress indicator? It can be seen that there is clear evidence that the relationship between the competitiveness index and the social progress index are positively associated.

For future work, it will be of great value to empirically test more robust theoretical and methodological models, as well as other metrics, in order to improve the statistical tests initially proposed here.

In this sense, it may be interesting to treat the data presented here with models that merge temporal senses and cross-section of the bank (such as data panel modeling) or add new control variables, in the search for a better weighting of the level of development of the countries. involved here (this, to improve the cut and go beyond the classic concepts of per capita income).

The research aimed to relate the concept of competitiveness of nations, based on competitiveness indicators reported by the WEF, obtained in competitiveness rankings, to the concepts of social progress, also reported in the ranking format by the Social Progress Imperative.

The study has limitations due to the intentional nature of the sample and the type of country present in both the WEF database and the IPS database. An additional limitation is related to the groupings of the countries that make up the sample, given that these may have influenced the results, due to the different compositions of countries in the sample.

The results are also subject to the phenomenon of reverse causality, ie: would the high Social Progress Indicator be a cause or result of the Competitiveness Indicator? To better study this aspect, a longer series of data or the use of the structural equations method would be necessary, which was not possible in this study due to the limitation in the number of years available for study.

Another alternative would be to search for the identification of which factors are most important for the performance of countries, according to the stage of development of each country, whether emerging or developed, as it is possible that, at different stages of development, some characteristics of countries are more critical for performance than others.

Finally, this work is in line with the findings developed by Arruda et al (2009), with regard to the relationship between the competitiveness index and GDP. In the present work, the social progress index was used as a proxy for GDP.

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## Author Detail

Joel Pereira Munhoz Junior,

Master in Business Administration from the Pontifical Catholic University of Paraná (PUCPR) Professor at UniFael University Center, Brazil

Institution: UniFael University Center (UniFael)

Adress: Avenue Sete de Setembro, 2775, Rebouças, Curitiba City, Paraná State, Brazil

E-mail: [joelmunhozjunior@gmail.com](mailto:joelmunhozjunior@gmail.com)

ORCID: <https://orcid.org/0000-0002-9611-6408>

Luciano Luiz Dalazen

Doctor in Administration Pontifical Catholic University of Paraná PUCPR, Brazil

Endereço: Rua Imaculada Conceição, 1155, Prado Velho, Curitiba City, Paraná State, Brazil, CEP 80215-901

E-mail: [ldalazen@yahoo.com.br](mailto:ldalazen@yahoo.com.br)

ORCID: 0000-0003-4354-6467

Luciana Santos Costa Vieira da Silva <sup>1</sup>

Scholarship holder FAPESQ-PB

Post-Doctoral Student at the Federal University of Paraíba (UFPB), Brazil

Institution: Federal University of Paraíba (UFPB)

Endereço: Lot. Cidade Universitária, João Pessoa City, Paraíba Statte, Brazil, CEP 58051-900

E-mail: [luvcosta10@gmail.com](mailto:luvcosta10@gmail.com)

ORCID: [orcid.org/000-0002-9538-715](https://orcid.org/000-0002-9538-715)

Robson de Faria Silva

E-mail: [faria762@hotmail.com](mailto:faria762@hotmail.com)

ORCID: <https://orcid.org/0000-0001-9404-3439>

Doutor em Administração Pontifícia Universidade Católica do Paraná PUCPR

Instituição de Vínculo atual: Centro de Ensino Superior CESUL

Av. Antonio de Paiva Cantelmo, 1222 - Industrial, Francisco Beltrão - PR, 85601-270

Bruno Nogueira Silva,

Master's student in Business Administration at the Federal Rural University of the Semi-Arid – (UFERSA), Brazil

Institution: Federal Rural University of the Semi-Arid – (UFERSA)/Department of Applied Social Sciences / Center for Applied Social Sciences and Humanities

Endereço: Rua Francisco Mota Bairro, 572 - Pres. Costa e Silva, Mossoró - RN, CEP 59625-900

Department of Applied Social Sciences / Center for Applied Social Sciences and Humanities

E-mail: [b.nogueira.silva@gmail.com](mailto:b.nogueira.silva@gmail.com)

ORCID: 0000-0002-9991-4595

Joyce Silva Soares de Lima

Master's student in Business Administration at the Federal Rural University of the Semi-Arid -UFERSA, Brazil

Institution: Federal Rural University of the Semi-Arid (UFERSA)/Department of Applied Social Sciences /  
Center for Applied Social Sciences and Humanities  
Endereço: Rua Francisco Mota n° 572 Bairro - Presidente Costa e Silva, Mossoró - RN, CEP 59625-900  
E-mail: [joycessdl@hotmail.com](mailto:joycessdl@hotmail.com)  
Orcid: 0000-0001-6852-5899

Fabíola Kaczam  
Bolsista DS/Capes  
Email: [kaczamf@gmail.com](mailto:kaczamf@gmail.com)  
ORCID: <https://orcid.org/0000-0002-0460-9927>  
Scholarship holder DS/Capes  
Doctoral Student of the Postgraduate Program in Administration at Federal University of Santa Maria -  
UFSM, Brazil  
Institution: Federal University of Santa Maria, Center for Social and Human Sciences. Address: Avenur  
Roraima, n° 1000 Postgraduate Program in Administration, Prédio 74C, 2° andar, Sala 4209. Camobi,  
97105900 - Santa Maria City, Rio Grande do Sul State, Brazil.