



Gross National Happiness: Statistical Model with Open Data

Andréa Cristina Fermiano Fidelis, Priscila Bresolin Tisott,
Ricardo Gouveia Rodrigues

RESUMO

Desde a década de 1960, várias organizações globais estão utilizando medidas de desenvolvimento que incluem não apenas os indicadores econômicos, mas também os indicadores sociais. Desta forma, apresenta-se o indicador de Felicidade Nacional Bruta (GNH), desenvolvida em 1970 no Butão, que utiliza um maior número de variáveis para medir o bem-estar e a qualidade de vida, distribuídos em quatro pilares fundamentais e nove eixos. Este trabalho teve como objetivo verificar quais variáveis independentes influenciam a construção do GNH de um país. Para este propósito, utilizou-se uma Regressão Linear Múltipla. Os resultados mostraram que as seguintes variáveis podem prever o GNH de um país: expectativa de vida saudável, apoio social, PIB per capita, liberdade para fazer escolhas de vida e percepções de corrupção.

1 INTRODUCTION

Since the 1960s, various global organizations such as the United Nations Council (UN), the European Economic Community (EEC), the Organization for Economic Co-operation and Development (OECD) have sought to develop measures that include social indicators as they considered that only the economic indexes did not portray the reality of the development and quality of life of a given country. (SALES et al., 2013).

Advocates of social indicators criticized the predominant use of the GDP (Gross Development Product) index, which reflects quantitative analyzes of the economic development of a society, unrelated to the environmental, cultural or even the quality of life of the population. GDP growth excludes the relationship with the qualitative production of development, since the true economic development must result in improvements in the living conditions of the country's population. (HELLIWELL, LAYARD e SACHS, 2015).

From this effort many social and welfare dimensions have begun to form part of an immense variety of programs developed by world organizations, producing statistics and indicators interested in expressing the happiness and the sustainable growth of the nations. Within this context, the HDI (Human Development Index) is one of the most well-known indices by world economists. (CENTER FOR BUTHAN STUDIES, 2012).

A small Asian country called Buthan, on the initiative of its fourth king, in 1970 developed a sign called Gross National Happiness (GNH). This indicator included quantitative analyzes, such as GDP. However, its focus was on integrating social indicators with a qualitative perspective. (TONG, WANG e LIU, 2009). The precepts guiding the construction of this instrument were based on a holistic view of the human being based on the Buddhist philosophy. (CENTER FOR BUTHAN STUDIES, 2012).

GNH is more complex than the HDI because it uses a greater number of variables to measure well-being and quality of life, distributed in four fundamental pillars and nine axes, such as: good governance, standard of living, use of time, environmental quality, education, health, community vitality, cultural promotion and preservation, and psychological well-being. (MARTINEZ e MAMED, 2015).

It is currently possible to access GNH research reports and data in 156 countries on the 'World Happiness Report 2016 Update', page accessed at <http://worldhappiness.report/ed/2016/>. This online platform provides free data on happiness index of participating nations in the sample. This way, it was possible to address following



research question: which independent variables influence the construction of the GNH of a country?

Based on this open data of 2016, this work carried out a Multiple Linear Regression with the objective of verifying which independent variables influence the construction of the GNH of a country. As a dependent variable, the variable Happiness score (GNH) was selected. The independent variables are GDP per capita, social support, healthy life expectancy, freedom to make life choice, generosity and perception of corruption. Data were processed using SPSS software.

The following is a brief theoretical discussion on GNH, the methodology used, as well as the discussion and presentations of the results. The statistical conclusions point to a significant model capable of predicting the happiness index of a given country from the studies of the selected independent variables.

2 THEORETICAL REVIEW

2.1 GROSS NATIONAL HAPPINESS - GNH

The Gross National Happiness index arised on the initiative of the fourth king of Buthan Jigme Singye Wangchuc in the year 1970, with the intention to measure the gross domestic happiness of the population of Buthan. Its aim was to develop a systemic indicator that reflected the qualitative and quantitative aspects of the people of their country, giving it an effective tool for political decision making. (TONG, WANG e LIU, 2009, TOBGAG et al., 2011).

The GNH is based on the belief that happiness is the fundamental goal and purpose of people's lives. That is why the whole development of a country must be directed towards promoting an environment that increases the happiness of its citizens. In this principle, it is the state's duty to promote public policies oriented within a holistic view of life (THINLEY, 2008; HELLIWELL, LAYARD e SACHS, 2015).

Their findings indicate that the creation and development of this index has made the small Asian country visible to the world. The author points out that the global interest in GNH is due to this being an indicator that surpasses the traditional and imperfect Gross National Product and the materialistic notions that it promotes. The concepts of happiness index highlight social and environmental aspects, indicating an alternative way for countries to measure their development.

The philosophical foundations underlying the dimensions of GNH, according to Metz (2014), come from the beliefs and practices of Buddhism. This approach is beyond the exercise of religiosity. It is guided by the search for the balance of life, through an integrated vision of the human being, about nature, with society, with physical and spiritual goods. Physical and mental well-being should be pursued daily. Achieving this balance is living in happiness.

It's important to highlight that the concept of happiness adopted in Bhutan, which consist the basis of the GNH indicator, is different from the concept of happiness commonly used in Western culture. This concept does not concern hedonic aspects, but is oriented within a view of the Buddhist philosophy of happiness in which "happiness is essentially a state of mind or conscience, and mind / consciouness is distinct from matter" (TIDEMAN, 2004, p. 224).

Tideman (2004, p.222) presentes the budhist definition for hapiness: "happiness is an innate state of mind which can be cultivated throught spiritual pratice, overcoming mental and emotional states which inducen suffering.". This concept goes through two ways: the first one includes not only the subjective psychological well-being, but also the harmony with nature and concern for others. The second, it internalizes other-regarding motivations (URA et al., 2012).

The first elected Prime Minister of Bhutan stated that:



“We have now clearly distinguished the ‘happiness’ (...) in GNH from the fleeting, pleasurable ‘feel good’ moods so often associated with that term. We know that true abiding happiness cannot exist while others suffer, and comes only from serving others, living in harmony with nature, and realizing our innate wisdom and the true and brilliant nature of our own minds.”(THINLEY, 2008)

Considering the holistic view in which the GNH was constructed, such authors (URA et al., 2012) discuss the limitation of exclusively economic indexes, such as Gross Domestic Product (GDP). The GDP, widely used to identify the economic growth of nations, includes only quantitative variables. The exclusion of qualitative dimensions leaves aside crucial issues such as sustainable development, aggression against natural resources and the environment, income distribution, public safety, population health, access to education, among other social indicators (TIDEMAN, 2004; SALES et al., 2013; ANTOLINI, 2016).

Helliwell et al., (2015) argue that it is necessary to broaden the measurement of inequalities beyond income and wealth by realizing that the development of a nation occurs in a wider social context, respecting culture, natural resources, health, quality of life of their families and their relationships with their community.

In this way GNH, through the multiple social variables, makes it possible to identify a broader picture of the citizens of a nation, including subjective aspects such as happiness and quality of life. This holistic vision endows public power with a tool that can accompany and guide state decisions for the greater good of the population, in the perspective of happiness as pointed out by Buddhist philosophy (RGoB - Royal Government of Bhutan - 2012). In this way it is important to emphasize that:

“For better or for worse, economies and business don't function separately from our decisions, since without us they wouldn't exist. So if we want a better economy we have to look deeply at who we are and how we live” (TIDEMAN, 2004, p.230).

The GNH variables are built under four strategic areas called pillars. These are: 1. Sustainable and equitable socio-economic development; 2. Environmental conservation; 3. Preservation and promotion of culture; And 4. Good governance. These pillars are articulated in 09 domains (RGOB, 2012).

The 9 domains are: 1. Psychological wellbeing, 2. Health, 3. Time use, 4. Education, 5. Cultural diversity and resilience, 6. Good Governance, 7. Community vitality, 8. Ecological diversity and resilience, 9. Living standard. This domain are aggregated in 33 clustered (grouped) indicators. The 33 clustered indicators have 124 variables, the basic building blocks of GNH Index (Centre for Buthan Studies, 2012).

People can be considered happy when they have achieved sufficiency in six of the nine domains. This can show sufficiency in 66% of the (weighted) indicators or more. The people were identified as extensively happy or deeply happy. (URA et al., 2012, Centre for Buthan Studies, 2012).

However, GNH assessments and interpretations seek to respect differences between individuals, having different weights for each issue. When it is measured, the first step is to perceive the most relevant variables for each group. For example, the priorities and concerns of a person living in the countryside are different from those living in urban areas. (URA et al., 2012)

Another issue is an understanding that happiness is not a state reached in all domains at same time and with an equal intensity. People can compensate for adverse situations with positive ones and remain balanced and happy (BUTHAN, 2012) (DURAHIM e COŞKUN, 2015).

After data analizys, GNH results are organized by region, language and other sample-



specific ramifications that help mapping in which domains investment is needed so that the population can achieve a higher quality of life and well-being. In this way, the index becomes an efficient public tool to guide policies that meet the specific needs of different groups and to monitor the changes and impacts of government decisions over time (URA et al., 2012).

3 METHOD

As methodology, it was used a Multiple Linear Regression, as this is a statistical tool that allows to verify if many independent variables can explain (or not explain) the variation of a dependent variable (HAIR Jr, et al, 2005). The use of Multiple Linear Regression selects the variables that have significance for the construction of a given model that can explain and / or predict a given behavior that is being studied (SAMOHYL, 2009).

The objective of this paper was to verify which independent variables influence the construction of the GNH of a country. To achieve this goal, the GNH of 156 countries (N = 156) was collected in 2016 and the independent variables presented for this analysis. As a dependent variable, the variable happiness score (GNH) was selected. The independent variables are GDP per capita, social support, healthy life expectancy, freedom to make life choice, generosity and perception of corruption. The countries used in this research can be found in attachment 1.

The selected data are available on the website <http://worldhappiness.report/ed/2016/>. This page presents, in addition to the GNH of the year 2016, several other results that are accessible in its platform. Data processing was performed using SPSS 24 software. The data used for analysis are attached. The results will be discussed in the next section.

Maroco (2007) suggest observing steps to realize the Multiple Linear Regression. In the first place it's necessary to organize data in SPSS, in order to proceed a factorial analysis. This way it's necessary to determine the correlations between all variables, extract the significative value, transform it using the rotation process and construct factorial scores. Once the scores are identified, they can be analyzed using a Multiple Linear Regression, to analyze a linear relation which involves more than two variables.

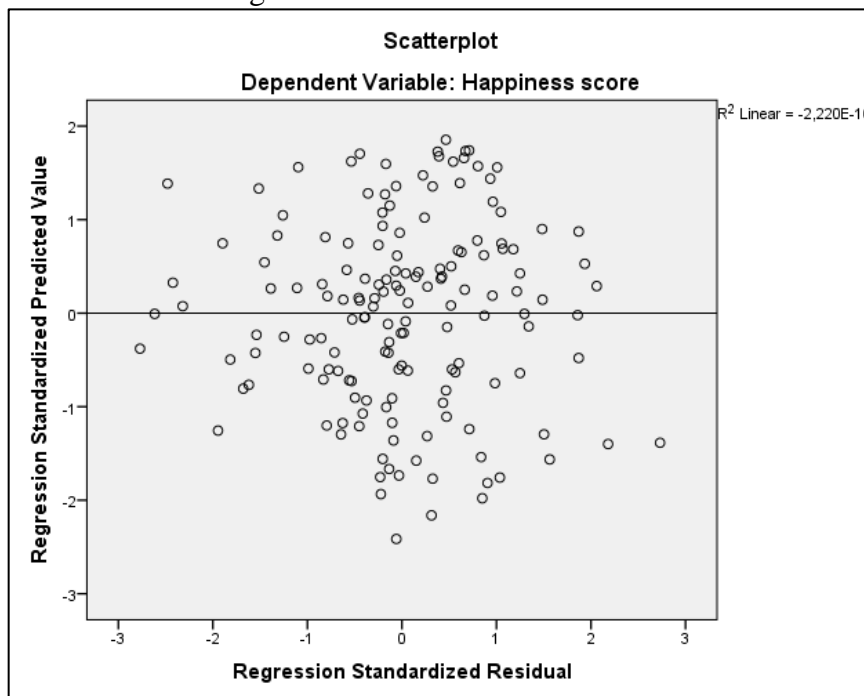
4 DISCUSSION OF RESULTS

According to the authors Maroco (2007) and Samohyl (2009), when performing a Multiple Linear Regression, it is necessary to observe some assumptions. These assumptions are normality and random distribution of residues, homoscedasticity and independence of residues.

The randomness of the residues was verified by the Kolmogorov-Smirnov test. The result of p-value is 0.2, that is, greater than 0.05. This result indicates that the residues follow a normal distribution according to graph 1 - Distribution of Residues.



Figure 1: Distribution of Residues



Source: the authors (2017).

In relation to collinearity, the values of FIV have values lower than ten indicating that there is no multicollinearity.

With the intention of predicting if the GNH of a given country is found through the independent variables GDP per capita, social support, Healthy life expectancy, freedom to make life choice, generosity and perception of corruption expressed in a significant model was used the statistical method of Multiple Regression. The R^2 found indicates that this model has statistical significance and that its explained quality is 78.8%.

The analysis of variance (ANOVA), in table 1 shows the following: ANOVA below, identified a p (value) <0.05 ($p = 0.000$) indicating that the coefficients are significant.

Table 1: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	160,128	6	26,688	92,654	,000 ^b
Residual	43,206	150	,288		
Total	203,333	156			

Source: the author.

The quality of the model, interpreted through the adjusted R^2 value, indicates that the model explains 78% of the happiness index variability. The obtained model was significant with a p-value of less than 0.01, according to Table 2 – Model. The coefficients can be verified according to Table 2 – Coefficients, as below.



Table 2: Model

Model	R	R square	Adjusted R square	Error
1	,887 ^a	,788	,779	,536691

a. Predictors: (Constant), Explained by: Perceptions of corruption, Explained by: Social support, Explained by: Generosity, Explained by: Healthy life expectancy, Explained by: Freedom to make life choices, Explained by: GDP per capita

b. Dependent Variable: Happiness score

Source: the author.

Table 3: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
	B	Std. Error	Beta	t		Tolerance	VIF
(Constant)	2,212	,150		14,731	,000		
Explained by: GDP per capita	,697	,209	,252	3,329	,001	246	4,066
Explained by: Freedom to make life choices	1,559	,373	,199	4,175	,000	622	1,607
Explained by: Social support	1,234	,229	,288	5,393	,000	493	2,029
Explained by: Healthy life expectancy	1,462	,343	,294	4,264	,000	297	3,369
Explained by: Perceptions of corruption	,959	,455	,093	2,110	,037	721	1,387

Source: the author.

The obtained model is the following:

$$GNH = 2,212 + 0,697 \times GDP + 1,559 \times \text{Freedom to make life choices} + 1,234 \times \text{Social support} + 1,462 \times \text{Health life expectancy} + 0,959 \times \text{Perceptions of corruption}.$$

This model can predict the happiness index of a given country considering the results achieved in the presented indicators. Analyzing the standardized coefficients (beta) the weights of the model variables correspond to: Healthy life expectancy (0,294), Social support (0,288), GDP per capita (0,697), Freedom to make life choices (0,199) and Perceptions of corruption (0,093).

These indicators present in the model not only include materialistic and economic



issues, represented by the GPD index, but emphasize that other variables matter to achieve happiness, in the national context (ANTOLINI, 2016). According to Tideman (2004) and the report described in RGOB (2014), the responses obtained in the GNH assessment should be the subject of policy analysis for the elaboration of a national action plan in order to fill the areas in greater imbalance and maintain what results in the happiness of the population.

Based on the results obtained in the 'healthy life expectancy' indicator, citizens' expectations regarding their physical health and quality of life are deposited in this indicator. In this index, it is possible to mobilize actions to guarantee and improve access to health, vaccination campaigns, follow-up of pregnant women, children and the elderly and investments in the quality of life of the nation.

Analyzing the 'Social Support' indicator, the political group should be alert to national security, family and community living, promoting local culture. As for the issue of 'Freedom to make life choices', the public administration should give access to study, freedom of information and self-expression, including religious beliefs and political freedom, and the economic condition necessary for the population to use its creativity, will and intelligence during his life. Finally, the 'Perceptions of Corruption' indicator is the condition that a nation can believe in its leaders and political representatives, being a country that practices ethics and national sovereignty in its public life.

GNH, from its original conception, appears not only as a national index but as an instrument to be used by the public administration with a view to improving the integral condition of a people's life, seeking happiness with a balance between individual and social life. It is expected that international governments can analyze their internal growth linked to the quality of life of their population and not only in the accumulation of income as it is currently proposed. May Buthan's initiative continue to encourage the development of a holistic vision for the planet, centered on people and not on materialism.

5 CONCLUSIONS

The objective of this paper was to verify which independent variables influence the construction of the GNH of a country. As a dependent variable, the variable happiness score (GNH) was selected. The independent variables were GDP per capita, social support, healthy life expectancy, freedom to make life choice, generosity and perception of corruption.

This index was used because GNH makes it possible to measure and monitor the quality of life of a nation and the impact that political and economic decisions have on citizens' daily lives. The used method allowed to verify that GDP per capita, social support, healthy life expectancy, freedom to make life choice and perception of corruption influence the GNH of a country, emphasizing the importance of an holistic view of individuals and nations in order to build a different system of life. These results show that countries should focus on social programs, allowing to increase the GNH of countries and, therefore, their economy. The results showed that generosity is not significative in the model.

This paper was based only on the data provided by the online platform of the World Happiness Report 2016. There was no verification of the data presented and comparison of the indicators in other platforms that presents measurements with GNH. Through these open data it is possible to make analyzes with other indices and variables, stratifying the answers by regions, continents, language or culture.

It is also possible to make comparisons and analyzes of the data with the results obtained in the previous years, to verify if there is evolution in the index of happiness of the countries that participate in the data collection since the first global researches.



REFERENCES

- ANTOLINI, Fabrizio. The Evolution of National Accounting and New Statistical Information: Happiness and Gross Domestic Product, Can We Measure It?. *Social Indicators Research*, v. 129, n. 3, p. 1075-1092, 2016.
- CENTRE FOR BUTHAN STUDIES. Gross National Happiness Index Explained in Detail, 1–6, 2012. Retrieved from http://www.grossnationalhappiness.com/docs/GNH/PDFs/Sabina_Alkire_method.pdf
- DURAHIM, Ahmet Onur; COŞKUN, Mustafa. # iamhappybecause: Gross National Happiness through Twitter analysis and big data. *Technological Forecasting and Social Change*, v. 99, p. 92-105, 2015. <http://doi.org/10.1016/j.techfore.2015.06.035>
- HAIR, Joseph F. et al. *Análise multivariada de dados*. Bookman Editora, 2009.
- HELLIWELL, John; LAYARD, Richard; SACHS, Jeffrey. *World happiness report*. 2012. Retrieved from <http://eprints.lse.ac.uk/47487/>
- MAROCO, João. *Análise estatística com utilização do SPSS*. 2007.
- RODRIGO-MARTINEZ, Sergio; MAMED, D. O. A Construção Sustentável das Políticas Públicas a Partir Do Fib (Índice De Felicidade Bruta). *Revista Direito a Sustentabilidade*, v. 1, n. 1, 2014.
- METZ, Thaddeus. Gross national happiness: A philosophical appraisal. *Ethics and Social Welfare*, v. 8, n. 3, p. 218-232, 2014.
- MUNRO, Lauchlan T. Where Did Bhutan's Gross National Happiness Come From? The Origins Of An Invented Tradition. *Asian Affairs*, v. 47, n. 1, p. 71-92, 2016.
- RGOB (Royal Government of Bhutan). *Bhutan: In Pursuit of Sustainable Development. National Report for the United Nations Conference on Sustainable Development*, 54, 2012.
- SALES, Aline et al. Felicidade interna bruta: aplicação e discussão no contexto de cidades de porte médio brasileiras. *Revista Cade*, v. 12, n. 1, 2013.
- SAMOHYL, Robert Wayne. *Controle estatístico de qualidade*. Elsevier, 2009.
- THINLEY, J. H. E. *Discurso rei butão.pdf*. In 63 session of the general assembly of the unithenations friday, september 26 new York, pp. 1–5, 2008.
- TIDEMAN, Sander G. Gross national happiness: towards a new paradigm in economics. In: *First International Conference on Operationalization of Gross National Happiness*. Thimphu: The Centre for Bhutan Studies, 2004. p. 186-187.
- TONG, Hengqing; WANG, Wenjuan; LIU, Hengwen. The Research of the Social Stability Based on Measure of Gross National Happiness. In: *Bioinformatics and Biomedical Engineering*, 2009. ICBBE 2009. 3rd International Conference on. IEEE, 2009. p. 1-4. <http://doi.org/10.1109/ICBBE.2009.5163656>



URA, Karma et al. A short guide to gross national happiness index. The Centre for Bhutan Studies, 2012.