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## Article

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# Gross National Happiness in Brazil: An analysis of its determinants

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## Abstract

It analyzed the determinants of happiness in Brazil from two categories of variables, formed by micro variables and other macros by socioeconomic variables. Considering the basis of data from WVS and IPEA for the years 2006 and 2014, estimated a logit model ordered and their marginal effects. Among the results, it was concluded that income positively influences the probability of being happy and that the Easterlin paradox remains also in Brazil. Since income is not the only determinant of influence on the probability of happiness, suggests the creation of an index with additional factors to measure well-being.

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## RESUMO

Analisa-se os determinantes da felicidade no Brasil a partir de duas categorias de variáveis, uma formada por variáveis micros e outra por variáveis macros socioeconômico. Considerando a base nos dados da WVS e do IPEA para os anos de 2006 e 2014, estimou-se um modelo logit ordenado e seus efeitos marginais. Dentre os resultados, concluiu-se que a renda influencia positivamente a probabilidade de ser feliz e que o paradoxo de Easterlin se mantém também no Brasil. Desde que a renda não é o único determinante de influência sobre a probabilidade de felicidade, sugere-se a criação de um índice com fatores adicionais para mensurar o bem-estar.

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*Palavras-chave:* felicidade; felicidade interna bruta; bem-estar

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## 1. Introduction

Since the times of neoclassic economists, microeconomics happiness is defined in terms of utility maximization of material consumption and rational decisions. Based on an axiomatic approach and applying a revealed preference technique we aim at assessing personal wellbeing levels according to tangible goods and services (Guo and Hu, 2011). However, according to Thaler's conception (1992), it is questionable that such a subjective issue as utility can be measured in objective terms.

In this sense, Frey and Stutzer (2008), Diener (2005) and other authors advocate that wellbeing indicators are subjective, as the Revealed Preference theory is valid as long as individuals act in a totally rational way. However, what it is perceived in practical terms is individuals with limited rationale and unaware of their choices. Besides, this theory does not consider preferences of people with no income to spend.

Therefore, Guo and Hu (2011) argue that there is vast literature that questions the validity of the cardinal utility approach. For these authors, the ordinal approach is subjective, even if it is criticized by traditional economists. Due to its little scientificity, it is capable of capturing multiple factors that result in individual wellbeing. In the end, according to Braun and Hussain (2009) sustainable happiness is something multidimensional that does not only depend on financial indicators. Veenhoven (2007) suggests that as somebody's life may have several environmental effects, the number of utilities is almost endless.

Seeking to answer or prove some commonplace affirmations such as “money does not bring happiness” or “a short happy life is better than a long unhappy one”, a series of studies have been developed in recent years. Research developed by Guo and Hu (2011), Chuerattanakorn (2007), Veenhoven (2007), Di Tella and Macculloch (2005) and Di Tella et al. (2003) go in that direction.

In Brazil, besides the fact that this topic has been little explored, up to now, there are studies on happiness determinants that consider, besides personal data, a set of socioeconomic macro-variables. This is a highly motivating fact for the development of this research.

Other motivations lay in the recognition that this issue has been widely studied by researchers and public managers worldwide and the belief that happiness studies may become important tools to guide public policies seeking to improve wellbeing. In the end, if happiness must be considered as a ‘public good’, as Tobgay et al. (2011) suggests, then governments have the relevant attribution to offer the society those factors capable of granting more satisfactory living conditions.

Before these affirmations, the goal of this study is to verify happiness determinants in Brazil based on two different variable categories: one composed of a set of micro-variables represented by personal data and another one based on a set of macro-variables in social and financial aspects. Based on data provided by the World Values Survey (WVS) and IPEA/DATA, for 2006 and 2014, we estimated a multinomial logit model and its marginal effects.

Among the main results obtained, we verified that income positively affects happiness likelihood, although it is not the only impact factor. Additionally, the Easterlin paradox also seems to be confirmed in Brazil.

Besides the introduction, this article includes four other sections. The second section offers a brief literature review on happiness, emphasizing some wellbeing assessment measures, besides some empirical evidence. In the third section, we describe applied data and the organized multinomial logit model and marginal effects. The fourth section introduces estimated model results and their analysis. The last section draws the final considerations.

## 2. The determinants of happiness

The definition of happiness may have different concepts and denominations. Consistency tests have been developed by some psychologists, revealing that happy people are more optimistic, more sociable, more extroverted, and enjoy better sleep (Frey and Stutzer, 2008). For Veenhoven (2007), the term happiness, oftentimes used as a synonym for welfare or quality of life, may just mean a state of “spirit” or contentment that reveals how well a person is prepared to face the problems of life. For Sen (1992), happiness may materialize as being the skill or individual capacity of self-realization.

Veenhoven (2007) argues that words like happiness and satisfaction may not have the same connotation in different languages and that in countries where happiness is more important for the society, as in some western countries, people would be more inclined to exaggerate their “joie de vivre”. According to Di Tella and Macculloch (2005), people may

be frequently affected by what they believe is the socially desirable answer in the interview moment. If the social norm is being happy, people may misstate their answers.

Frey and Stutzer (2008) narrate that there are important individual welfare assessments. A curious method, completely different and unusual is called “Brain Imaging”. This method is related to neuroscience and consists of digitalizing brain activity through magnetic resonance, which monitors blood influx in the brain.

Shedler et al. studies (1993) show that happiness data is negatively related to heart rate and blood pressure levels in stress response. Sutton and Davidson (1997) proved that happiness data is positively related to EEG prefrontal brain activity (the brain area that is linked to optimism and other positive states of mind) (Di Tella and Macculloch, 2005).

Despite these several subjective happiness assessment possibilities, Frey and Stutzer (2008) argue that almost all empirical research on happiness developed by economists has been based on people’s evaluations on their satisfaction levels with life. In this sense the “World Values Survey” is a very popular database, with information on nearly ninety percent of the world’s population.

### 2.1. Gross National Happiness

Although the Gross National Product (GDP) was not created for this purpose, through the last forty years, this indicator has been used as a means to measure the progress and development of countries in general. However, public managers have paid too much attention to the GDP without considering the real social welfare standards. For example, let’s analyze the case of the United States between 1999 and 2007. Although the American GDP has increased constantly during this period, according to Braun and Hussain (2009) there was a general decline in living conditions for most Americans. For these authors, besides the fact that the GDP does not capture existent social inequalities, it does also not reflect what money is spent on.<sup>1</sup>

Alternatively to the GDP analysis and seeking to discover social wellbeing levels through a subjective holistic method, in 1972, a Gross National Happiness (GNH) Index was created in Bhutan.<sup>2</sup> This indicator is based on four dimensions (equality and economic development, environmental preservation, cultural resilience and good governance) and nine sub-dimensions (income, psychological wellbeing, time use, communitarian strength, health, education, ecological diversity, living standards and good governance). Such index has been used by the Bhutan government to create public policies (Braun and Hussain, 2009).

According to Brooks (2013), despite the country’s socioeconomic problems, Bhutan’s quality of life has improved in recent decades. There has been a poverty reduction and improvements in basic health care, air quality, education, access to drinkable water and sanitation, as well as improvements in roads infrastructure and gender equality. Besides giving value to environmental and socioeconomic aspects, it has the highest GDP per capita in south Asia and it is the only country in the region that is devoted to complying with all the Millennium’s goals. According to Braun and Hussain (2009), although the GNH has been developed by a small, homogeneous country with few cultural, religious and material adversities, the applicability of this index is possible in any other country by merely adapting it to the regional socio-cultural context.

Inspired in the Bhutanese GNH index, in 2012, the United Nations (UN) organized the International Conference on Wellbeing and Happiness. On that occasion, the International Happiness Day was created, and it is celebrated every year on March 20 with the argument that happiness and welfare are universal goals and the inspiration for public policies worldwide.

This indicator became internationally known in 1986, when Wangchuck, a Bhutanese political leader, affirmed in the Financial Times that “*the Gross National Happiness is more important than the Gross Domestic Product*”. Since

<sup>1</sup> Brooks (2013) explains that beyond a certain level, additional GDP improvements produce decreasing returns in life expectancy, infant mortality, satisfaction with life and happiness, among other factors. This disconnection between GDP and wellbeing is demonstrated in some studies, such as those developed by Antal and Bergh (2014) and Constanza et al. (2009) who also corroborated a loss in leisure time and a depletion of natural resources.

<sup>2</sup> Bhutan is a country of 725,000 inhabitants with a total area of 38,394 km. It is located in the Himalaya and has frontiers with China and India. Only in 2008 the country stopped being an absolute monarchy to become a multiparty parliamentary monarchy. Despite the fact that Bhutan was never colonized, it remained relatively isolated until 1961, when a search for development based on Buddhist philosophy began. With an annual growth rate of 7.5%, Bhutan is still a poor country, as 23% of its population lives below the poverty line and the 20% richest earn seven times more than the 20% poorest (Tobgay et al., 2011).

then, besides the appearance of a considerable amount of international literature on the subject, leaders from important nations have rethought the GDP role as a development indicator and studied alternative ways to measure social welfare (Frey and Stutzer, 2008).

Recently, for example, the French government promoted a commission lead by economist Joseph Stiglitz to question and analyze GDP attributes and seek wider wellbeing and sustainability measures. The Thai government implemented the National Progress Index (NPI), which gives priority to social, economic and environmental welfare. Likewise, the United Kingdom has developed the Happy Planet Index (HPI) that considers life expectancy indicators, ecological preservation and levels of satisfaction with life. There is also the Genuine Progress Index (GPI) and the Green GDP created in the United States and China, respectively. Germany and Canada also adopted similar indicators (Brooks, 2013; Braun and Hussain, 2009).

These global movements seek to promote, above all, sustainability and social equality. According to Frey and Stutzer (2008) the interest of countries on happiness studies are based, among other factors, on their close links to public health and education budgets.

## 2.2. Determinants of happiness

Although the first studies related to the economics of wellbeing date from the eighteenth century, it was only in 1974 that the first empirical study involving income and happiness was developed. When analyzing the evolution of income per capita and happiness in the United States, American economist Richard Easterlin perceived that initially, there was a significant positive correlation between these two variables. However, as from a certain level, higher income did not lead to higher happiness levels. This empirical evidence is known as the “Easterlin Paradox”.

Since Easterlin’s work (1974), one of the main challenges for economists who study welfare and happiness has been to explain such paradox. In other words, to understand why in many countries that had their per capita incomes considerably improved, happiness levels continued to be stable or even fell.

Based on the evidence that income is not the only determinant of happiness, several empirical studies have been developed, seeking to identify its determinants. It is therefore relevant to mention and introduce the main results obtained by these research studies, especially the most recent ones. In chronological order, it is worth mentioning the works developed by Guo and Hu (2011), Dias et al. (2010), Chuerattanakorn (2007), Veenhoven (2007), Corbi and Menezes-Filho (2006), Di Tella and Macculloch (2005) and Di Tella et al. (2003).<sup>3</sup>

Guo and Hu (2011) based on US economy data provided by the World Bank, performed a study on average individual happiness following a regression model that considered socioeconomic and demographic variables. Among other results, the authors verified a strong negative correlation between happiness and the unemployment and inflation variables.

Dias et al. (2010), based on a field research in which 540 dwellers were interviewed between 2007 and 2009 in Maringá-PR, Brazil, verified that people with higher education, married, with high income, satisfied with their current economic-financial situation and with positive expectations with regards to their future family income and the national economy tend to have more chances of being happy. Higher unhappiness probabilities are found in people with overdue bills and in those were victims of violence (robbery, theft, embezzlement, etc.) or have relatives who were victims of such crimes. The study also showed that women tend to be slightly happier than men and that aging is inversely related to happiness.

Through socioeconomic data collected from 1991 to 2004, Chuerattanakorn (2007) observed that people who were happy with living conditions in Germany were normally those with higher education who belong to a small family of German origin, are married or living with a steady partner. The study also revealed that lack of employment is associated to low welfare levels. This is more significant for men and for those aged between 30 and 49.

Based on a temporal series of twenty-five years for several developed and developing countries, Veenhoven (2007) calculated three happiness indicators, the Average Happiness (AH), Happy Life Years (HLY) and Inequality of Happiness (IH). AH indicators revealed that Russia is among the countries with the lowest average happiness level, while Sweden ranks among the highest among studied countries. As for HLY indicators, the highest score was found in

<sup>3</sup> Except for Veenhoven (2007), all other authors mentioned used the logit or probit regression models for their research.

Table 1  
Proportions of happiness in Brazil in 1991, 2006 and 2014.

Happiness level	1991	2006	2014
Very happy	21.0%	33.6%	35.4%
Happy	54.5%	56.7%	56.4%
Not very happy	21.9%	9.2%	7.4%
Unhappy	2.4%	0.56%	0.86%

Source: WVS.

Switzerland (62.9 years) and the lowest, in Zimbabwe (12.5 years). With regards to the IH, The Netherlands enjoys the lowest inequality level and Zimbabwe suffers the highest one.

This study also revealed that all through the years, happiness has not grown much in the United States<sup>4</sup> but stayed the same in Japan, where people live long lives but are not very happy. Instead, in Nigeria people live shorter lives but with higher levels of satisfaction. The research also demonstrated that the correlation between personal income and happiness is stronger in poor and weak countries than in rich countries and that the happiest nations are those in which people enjoy a higher degree of freedom, with no discrimination against women and more trust in interpersonal relations.

Utilizing WVS data from the nineties in Brazil, [Corbi and Menezes-Filho \(2006\)](#) analyzed the relation amongst some variables and the level of personal wellbeing of some individuals. The research showed that male, wealthier and employed people have better chances of being happy.

Another relevant work that studied this issue for member countries of the Organization for Economic Cooperation and Development (OECD) was developed by [Di Tella and Macculloch \(2005\)](#). These authors showed that happiness is positively correlated with absolute income and life expectancy and negatively correlated to the number of hours worked, environmental degradation, crime, commercial openness, inflation and unemployment.

[Di Tella et al. \(2003\)](#), considered micro and macroeconomics variables, estimating happiness in twelve European countries besides the United States, based on a sample period from 1972 to 1994. In this research, 27.29% of Americans and 32.66% of Europeans declared to be “very satisfied with the lives they were leading”. The research also revealed that women and married people tend to enjoy higher levels of happiness and that unemployment and GDP contractions exert a strong negative effect on welfare levels in all analyzed countries.

### 3. Methodological strategy

This section is dedicated to a brief description of data used in this study and to the introduction and specifications about the econometric model applied to the analysis of happiness determinants in Brazil.

In order to explain Gross National Happiness, we applied two sets of microeconomics and microeconomics variables for 2006 and 2014. The first study is composed of variables of individual characteristics obtained from the WVS database. The second is composed of a set of macro variables obtained from IPEA/DATA.

The set of micro variables was taken from the WVS database, a non-government organization located in Sweden that since 1981 develops socio-cultural and economics research studies in almost one hundred countries. The goal of this association is to generate a database of evolution of beliefs and values from people from all over the world aimed at social research and the development of public policies. In Brazil, the research comprised the years of 1991, 2006 and 2014.<sup>5</sup>

According to this database, for Brazil, in 1991, 2006 and 2014, 54.5%, 56.7% and 56.4% of people declared themselves to be “happy”. As for the “very happy” category, the percentages for the same years were 21%, 33.6% and 35.4%. As it can be observed from data entered on [Table 1](#), the vast majority of Brazilians stated to feel happier between the years 1991 and 2014.

<sup>4</sup> According to [Veenhoven \(2007\)](#), although the level of happiness has not improved much in the USA, what we observed in this country is a behavior opposite to what we call the “Easterlin Paradox”. This contradicts the current belief that Americans have become richer but not happier”.

<sup>5</sup> The year of 1991 was not considered for the model estimation due to the unavailability of WVS federal units data for that year.



Table 2  
Proportions of happiness categories per income deciles for 2006 and 2014.

Income/2006										
Happiness	1	2	3	4	5	6	7	8	9	10
1	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
2	0.15	0.12	0.13	0.11	0.05	0.08	0.04	0.03	0.07	0.00
3	0.56	0.55	0.57	0.58	0.56	0.56	0.62	0.53	0.47	0.62
4	0.27	0.31	0.30	0.30	0.39	0.35	0.35	0.44	0.47	0.38
Income/2014										
Happiness	1	2	3	4	5	6	7	8	9	10
1	0.03	0.01	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.00
2	0.07	0.12	0.05	0.11	0.08	0.06	0.02	0.08	0.08	0.00
3	0.54	0.57	0.65	0.55	0.58	0.60	0.53	0.44	0.33	0.67
4	0.36	0.31	0.30	0.33	0.34	0.34	0.43	0.46	0.58	0.33

Source: elaborated by the authors using the WVS database.

However, in this comparison, it should be highlighted that in 1991 not all Brazilian states were represented in this year's sample. Proportional comparison of statistical tests for all happiness levels between 2006 and 2014 was insignificant, which means that these proportions were practically the same in those two years.<sup>6</sup> These results differ from the worldwide tendency. WVS data (2015) demonstrates that in most countries where the research was conducted in recent years there was an increase in the proportion of people who declared to be 'very happy' or "happy", to the detriment of the other two happiness levels. This is the case in countries such as India, the United States, Argentina and Australia.

We also need to highlight that the seasonality of happiness feelings between 2006 and 2014 did not follow the improvement of some macroeconomic variables that took place in Brazil during this period. In fact, according to IPEA/DATA information provided by the Institute of Research for Applied Economics, the percentage of poor people according to caloric needs fell from 26.75% in 2006 to 13.25% in 2014. Likewise, income inequality as measured by the Gini coefficient fell from 0.563 in 2006 to 0.518 in 2014. At the same time, the per capita household income grew on average from R\$ 801.27 in 2006 to R\$ 1152.24 in 2014.

This research considered a total of 2699 interviews. In 2006, 1421 people were interviewed whereas in 2014 1277 individuals were questioned.

Microeconomic variables applied in the econometric model estimation to be specified in the next subsection are: *the income scale and the interviewee age plus thirty dummies based on the following variables: occupation, highest education level, marital status, sex, ethnic group, city size and region.*

Using the IPEA/DATA, the five macro-socioeconomic variables were: *the homicide and suicide rate per 100,000 inhabitants, the percentage of poor people, the Gini index as an income inequality measurement, the open unemployment rate and government expenses.*<sup>7</sup> These macro-variables were disaggregated for each state for the two years considered for the research.<sup>8</sup> The interaction of these two sets of variables resulted in a total of thirty-seven explicative variables. **Chart 1** introduces a description of variables used in the estimation, as well as some statistical information.

<sup>6</sup> The *t*-Student statistics for equality tests for the happiness levels proportions *Unhappy*, *Not very happy*, *Happy* and *Very happy* were respectively equal to  $-0.93$ ,  $1.75$ ,  $0.14$  and  $-0.99$ . For a significance level of 5%, the proportional equality hypothesis is not rejected.

<sup>7</sup> For the construction of such variable, the following federal government expenses were added: expenses in education and culture; health and basic sanitation and housing and urbanism. Seeking to obtain the per capita expense per state, we divided the addition of such expenses by the total number of inhabitants of each federal unit.

<sup>8</sup> Macro-variables for 2014 were estimated based on their temporal series based on the ARIMA method (1,1,1). The only exception was the *homicide rate* in the state of Rio Grande do Norte, where the ARIMA model was applied (1,2,1).

### 3.1. The econometric model

In order to find an answer to the “state of happiness”, the WVS research asked the following question: *In general, how do you see yourself? The answer had to be one of these options:*

- Very happy
- Happy
- Not very happy
- Unhappy

Therefore, let's consider  $y_i^*$  as a continuous latent variable that represents the *state of happiness* of an individual  $i$ . In these terms, we can define the following dichotomous variables: *state of happiness*<sup>1</sup> = 1 if a person answers *Unhappy* and 0 in the opposite case; *state of happiness*<sup>2</sup> = 1 if a person answers *Not very happy* and 0 in the opposite case; *state of happiness*<sup>3</sup> = 1 if a person answers *Happy* and 0 in the opposite case; *state of happiness*<sup>4</sup> = 1 if a person answers *Very happy* and 0 in the opposite case. Equivalently, we could also argue that *state of happiness*<sup>1</sup> = 1 if *state of happiness* <  $k_1$ ; *state of happiness*<sup>2</sup> = 1 if  $k_1$  < *state of happiness* <  $k_2$ ; *state of happiness*<sup>3</sup> = 1 if  $k_2$  < *state of happiness* <  $k_3$  and *state of happiness*<sup>4</sup> = 1 if *state of happiness* >  $k_3$ , where  $k_1$ ,  $k_2$  and  $k_3$  are the limits in which the latent variable *state of happiness* needs to be higher than the correspondent dichotomous variable in order to change.

As observed by Di Tella and Macculloch (2005) and Corbi and Menezes-Filho (2006), the connection between the variable  $y_i$  that represents the answer to the question “*In general, how do you see yourself?*” and the latent variable  $y_i^*$  may be described as:

$$y_i = \begin{cases} 1, & \text{if } k_1 \leq y_i^* \\ 2, & \text{if } k_1 < y_i^* \leq k_2 \\ 3, & \text{if } k_2 < y_i^* \leq k_3 \\ 4, & \text{if } k_3 < y_i^*, \end{cases} \quad (1)$$

We can now notice that the answer variable  $y_i$  is placed from the lowest happiness level ( $y_i = 1$  for the answer “unhappy”) to the highest level ( $y_i = 4$  for the answer “very happy”).

Imagine that the relation between the latent variable  $y_i^*$  and the explicative variable vectors  $X_i$  and  $Z_i$  that represent the set of micro and macro-variables introduced in the previous section is specified as:

$$y_i^* = X_i\beta_1 + Z_i\beta_2 + \varepsilon_i, \quad (2)$$

where  $\beta_1$  and  $\beta_2$  are parameters to be estimated and  $\varepsilon_i$  is a random error.

The estimation of parameters of Eq. (2) by Ordinary Least Squares is infeasible, as the response variable is ordered. Besides, it is desirable that the relation between the probability of a given answer and an explicative variable is non-linear and whenever the values of  $X_i$  or  $Z_i$  tend to decrease (grow) this probability should converge more slowly towards zero (one). A probability distribution with these characteristics is a logit distribution. In this sense, supposing that the random error distribution of Eq. (2) follows this distribution, it is possible to estimate parameters  $\beta_1$  and  $\beta_2$  of Eq. (2) and  $k_1$ ,  $k_2$  and  $k_3$  of Eq. (1) through an ordered multinomial logit model.

Since residuals  $\varepsilon_i$  follow a logistic distribution, the probability for a  $y_i$  response bigger than a  $j$  category shall be:

$$P(y_i < j / X_i, Z_i) = \frac{\exp(k_j - X_i\beta_2 - Z_i\beta_2)}{1 + \exp(k_j - X_i\beta_2 - Z_i\beta_2)}.$$

Considering the logarithm in both sides of the previous equation, we obtain the following logit model:

$$\log \left\{ \frac{P(y_i < j / X_i, Z_i)}{P(y_i \geq j / X_i, Z_i)} \right\} = X_i\beta_1 + \beta_2 Z_i\beta_2, \quad (3)$$



where the first term on the right side of Eq. (3) is the logarithm that suggests the probability of obtaining results larger than  $j$  related to the chance of obtaining equal or smaller results than  $j$ . Additionally, if the goal is to estimate the impact on this probability based on a unit variation of one  $k$ -th component of  $X$  or  $Z$ , we have that:

$$\frac{P(y_i < j/X_i, Z_i)}{P(y_i \geq j/X_i, Z_i)} = \exp(-\beta_k), \quad (4)$$

in which  $\beta_k$  is the parameter associated to this component.

Seeking to calculate the marginal effects of variations in explicative variables of  $X$  and  $Z$  on  $P(y = j/X, Z)$ , we have that Eq. (2)  $P(y = j/X, Z) = P(k_{j-1} \leq y^* \leq k_{j-1}/X, Z)$ . Replacing Eq. (1) in this last equation, we have that  $P(y = j/X, Z) = F(k_j - \beta_1 X - \beta_2 Z) - F(k_{j-1} - X\beta_1 - Z\beta_2)$ , where  $F(\cdot)$  is the distribution function accumulated from the random error  $\varepsilon$ . Notice that for  $j=1$  and  $j=4$ , we need to have  $P(y = 1/X, Z) = F(k_1 - X\beta_1 - Z\beta_2)$  and  $P(y = 4/X, Z) = 1 - F(k_3 - X\beta_1 - Z\beta_2)$ . In these terms, the marginal variation in the probability  $P(y = j/X, Z)$  due to an increase of some  $x$  or  $z$  component is considered as:

$$\frac{\partial P(y = j/W)}{\partial w_l} = \frac{\partial F(k_j - W\beta)}{\partial w_l} - \frac{\partial F(k_{j-1} - W\beta)}{\partial w_l} \quad (5)$$

where  $w_l$  is a component from the vector  $W=(X,Z)$  and  $\beta$  is the corresponding parameter in vector  $\begin{pmatrix} \beta_1 \\ \beta_2 \end{pmatrix}$ .

#### 4. Obtained evidence

Table 3 introduces estimated results for the ordered multinomial logit model<sup>9</sup> for the probability ratio in the “less happiness” categories with respect to the “more happiness” ones, as show in Eq. (3).

However, seeking to analyze the impact of explicative variables on the probability ratio, conclusions shall be based on the “more happiness” categories with regards to the “less happiness” ones. For this purpose, it is enough to consider the value of  $\exp(\beta_k)$  as a measurement for such impact.

Within the statistically significant variables shown for a significance level of 5%, results show that a one decile income growth makes the probability to be happier increase in a 1.1 factor with regards to being less happy. In other words, there is a positive correlation between happiness and income. However, observe Table 2 data, which shows percentages for happiness category for each income level in 2006 and 2014.

The Easterlin paradox also seems to be confirmed in Brazil, In fact, besides finding a positive correlation between income and happiness we observe that for the “more happiness” categories (3 and 4) based on income deciles 5 and 6, the proportions to be happier are more stable. We also verified that income is not the only determinant to affect happiness categories in Brazil.

With regards to the employment status of individuals, the probability to be happier compared to being less happy is 1.2 times higher for those who are employed if compared to other types of occupations (students, housewives and retirees). This result agrees with findings by Guo and Hu (2011), Chuerattanakorn (2007) and Di Tella et al. (2003) for other countries that also verified a significant inverse relation between unemployment and happiness.

Within the set of personal explicative variables, the higher impact on the probability ratio of being happier compared to being less happy is explained by the “married” marital status. The probability of being happier is 1.6 times higher for married people if compared to those unmarried. This evidence reinforces results found by Di Tella et al. (2003) for other countries and Corbi and Menezes-Filho (2006) for Brazil.

The effect of people’s age on their happiness is represented by a U-shaped curve. Therefore, results suggest that the happiness trajectory is not constant throughout life. Initially, the probability of being happy falls as people age. After certain maturity is reached, happiness probabilities start to grow. This same characteristic was also noticed by Corbi and Menezes-Filho (2006).

As for the race component, we verified that the happiness probability ratio is 1.3 higher for blacks than for people of other races (indigenous, mixed race and yellow). However this causality is only relevant for significance levels above

<sup>9</sup> The likelihood ratio test resulted in a null  $p$ -value for the null hypothesis of proportion probability.

Table 3  
Logistic regression for happiness probability in Brazil.

Variables	Coef.	Std Dev.	Z	p-value
Income <sub>i</sub>	0.092	0.019	4.70	0.000
Dempl <sub>i</sub>	0.207	0.097	2.14	0.033
DUnempl <sub>i</sub>	-0.185	0.130	-1.42	0.156
DHighergrad <sub>i</sub>	0.121	0.413	0.29	0.769
DElemenMed <sub>i</sub>	-0.094	0.401	-0.24	0.813
DMarried <sub>i</sub>	0.473	0.083	5.64	0.000
DMale <sub>i</sub>	-0.00006	0.081	-0.00	0.999
Age <sub>i</sub>	-0.063	0.013	-4.47	0.000
Age 2 <sub>i</sub>	0.0006	0.0001	4.16	0.000
DWhite <sub>i</sub>	-0.004	0.089	-0.05	0.962
DBlack <sub>i</sub>	0.231	0.135	1.71	0.087
DCityMore500 <sub>i</sub>	0.090	0.090	0.99	0.320
DAM <sub>i</sub>	0.744	0.318	2.33	0.020
DPA <sub>i</sub>	0.036	0.380	0.10	0.923
DAL <sub>i</sub>	-0.194	0.442	-0.44	0.660
DBA <sub>i</sub>	0.317	0.281	1.13	0.259
DCE <sub>i</sub>	0.189	0.447	0.42	0.672
DPB <sub>i</sub>	0.514	0.373	1.38	0.169
DPE <sub>i</sub>	0.530	0.269	1.97	0.049
DDF <sub>i</sub>	-0.489	0.508	-0.96	0.336
DGO <sub>i</sub>	-0.589	0.678	-0.87	0.384
DMT <sub>i</sub>	-0.407	0.629	-0.65	0.517
DMS <sub>i</sub>	0.266	1.044	0.25	0.799
DES <sub>i</sub>	-0.371	0.758	-0.49	0.624
DMG <sub>i</sub>	0.041	0.530	0.08	0.938
DRJ <sub>i</sub>	-0.134	0.492	-0.27	0.785
DSP <sub>i</sub>	-0.259	0.457	-0.57	0.570
DPR <sub>i</sub>	-0.579	0.723	-0.80	0.423
DSC <sub>i</sub>	-0.873	0.921	-0.95	0.343
DRS <sub>i</sub>	-0.343	0.914	-0.38	0.708
Murder <sub>i</sub>	0.011	0.008	1.41	0.159
Suicide <sub>i</sub>	-0.056	0.093	-0.61	0.543
PO <sub>i</sub>	-0.030	0.031	-0.97	0.331
Gini <sub>i</sub>	-0.441	2.423	-0.18	0.855
Unemp Rate <sub>i</sub>	-0.157	0.101	-1.54	0.123
Pcap Exp	-9.31E-06	0.0001	-0.07	0.948
D2006	0.402	0.302	1.33	0.184

Source: author's estimations.

8.5%. For white people, there seems to be no causality on their happiness. The other model variables that describe personal characteristics were not statistically significant.

The geographical area of residence does not seem to have any correlations with the ratio likelihood to be more or less happy. The only state in which this relation was statistically significant was Amazonas, if compared to the state of Maranhão (base category). In intertemporal terms, there was no significant difference between the likelihood of being happy in 2006 and 2014. The *dummy* variable year did not prove significant.

In the macro-variable aspects, surprisingly, none of them showed a significant level with regards to happiness categories. In the end, it would be expectable that lower poverty rates, less income inequality and lower unemployment rates with higher per capita government spending affected people's happiness chances positively. A possible explanation to this is that as only two sample years were used, the variability of these variables was too small to impact likelihood ratios.

The analysis of marginal effects of explicative variables is then made on the probabilities of each happiness category. In other words, how much these likelihoods grow when there is unitary variation in one of these variables and the others are kept constant. Such effects are estimated according to Eq. (5) of Subsection 3.1 and introduced in Table 4. For statistic significance purposes, we considered a level of 5%.

Table 4  
Marginal effects for happiness probability in Brazil.

Variables	dy/dx (1)	p-value (1)	dy/dx (2)	p-value (2)	dy/dx (3)	p-value (3)	dy/dx (4)	p-value (4)
Income <sub>i</sub>	−0.0006	0.001	−0.006	0.000	−0.013	0.000	0.020	0.000
Dempl <sub>i</sub>	−0.001	0.055	−0.014	0.034	−0.030	0.032	0.046	0.032
DUnempl <sub>i</sub>	0.001	0.202	0.013	0.179	0.025	0.128	−0.040	0.146
DHighergrad <sub>i</sub>	−0.0007	0.761	−0.008	0.761	−0.018	0.776	0.027	0.772
DElemenMed <sub>i</sub>	0.0006	0.808	0.006	0.809	0.014	0.818	−0.021	0.815
DMarried <sub>i</sub>	−0.003	0.001	−0.034	0.000	−0.066	0.000	0.103	0.000
DMale <sub>i</sub>	0.000	0.999	0.000	0.999	0.000	0.999	0.000	0.999
Age <sub>i</sub>	0.0004	0.001	0.004	0.000	0.009	0.000	−0.014	0.000
Age 2 <sub>i</sub>	0.000	0.002	0.000	0.000	−0.0001	0.000	0.0001	0.000
DWhite <sub>i</sub>	0.000	0.962	0.0003	0.962	0.0006	0.962	−0.0009	0.962
DBlack <sub>i</sub>	−0.001	0.084	−0.015	0.066	−0.036	0.110	0.053	0.095
DCityMore500 <sub>i</sub>	−0.0006	0.325	−0.006	0.315	−0.013	0.326	0.020	0.322
DAM <sub>i</sub>	−0.003	0.007	−0.039	0.001	−0.136	0.040	0.179	0.024
DPA <sub>i</sub>	−0.0002	0.922	−0.002	0.922	−0.005	0.924	0.008	0.923
DAL <sub>i</sub>	0.001	0.689	0.014	0.683	0.025	0.622	−0.042	0.648
DBA <sub>i</sub>	−0.001	0.212	−0.020	0.203	−0.052	0.304	0.073	0.275
DCE <sub>i</sub>	−0.001	0.645	−0.012	0.648	−0.029	0.692	0.043	0.680
DPB <sub>i</sub>	−0.002	0.100	−0.029	0.088	−0.089	0.223	0.122	0.187
DPE <sub>i</sub>	−0.002	0.029	−0.030	0.016	−0.092	0.081	0.125	0.059
DDF <sub>i</sub>	0.003	0.449	0.041	0.419	0.053	0.135	−0.099	0.283
DGO <sub>i</sub>	0.005	0.508	0.052	0.477	0.060	0.107	−0.117	0.319
DMT <sub>i</sub>	0.003	0.594	0.033	0.576	0.047	0.372	−0.084	0.480
DMS <sub>i</sub>	−0.001	0.772	−0.016	0.775	−0.043	0.815	0.061	0.805
DES <sub>i</sub>	0.002	0.681	0.030	0.669	0.044	0.520	−0.077	0.597
DMG <sub>i</sub>	−0.0003	0.937	−0.002	0.937	−0.006	0.939	0.009	0.938
DRJ <sub>i</sub>	0.0009	0.795	0.009	0.793	0.018	0.774	−0.029	0.782
DSP <sub>i</sub>	0.001	0.602	0.019	0.594	0.035	0.535	−0.056	0.559
DPR <sub>i</sub>	0.004	0.535	0.050	0.507	0.061	0.173	−0.116	0.364
DSC <sub>i</sub>	0.008	0.521	0.085	0.471	0.069	0.000	−0.163	0.232
DRS <sub>i</sub>	0.002	0.746	0.027	0.738	0.042	0.643	−0.072	0.690
Murder <sub>i</sub>	−0.0001	0.170	−0.000	0.151	−0.001	0.158	0.002	0.158
Suicid <sub>i</sub>	0.0004	0.547	0.004	0.543	0.008	0.543	−0.012	0.543
PO <sub>i</sub>	0.0002	0.342	0.002	0.332	0.004	0.332	−0.006	0.331
Gini <sub>i</sub>	0.002	0.856	0.031	0.855	0.064	0.855	−0.098	0.855
Unempl <sub>i</sub>	0.001	0.144	0.011	0.124	0.023	0.123	−0.035	0.122
Per capita expense <sub>i</sub>	0.000	0.948	0.000	0.948	0.000	0.948	0.000	0.948
D2006	−0.002	0.215	−0.028	0.191	−0.057	0.175	0.089	0.180

Source: authors' estimations using WVS data (2006, 2014) and IPEA/DATA (2015). For dummies variables dy/dx, a discreet 0–1 change applies.

We verified that whenever there is an income increase of one decile the likelihoods of lower happiness levels fall, although these decreases are very small.

On the other hand, an increase in income deciles makes the chances of being “very happy” improve in 2%. For the intermediate “happy” category, which is halfway between the happiest and least happy states, a unitary income growth implies a probability decrease. It is worth highlighting, however, that this fall is of only 1%, approximately.

The fact of someone being employed reduces the chances of being “unhappy” or “not very happy” and increases the likelihood of being “very happy”. As it happens in the income effect, the probabilities of the intermediate category “happy” decrease when a person declares to be employed. When someone is married, the chances of being “unhappy” or “not very happy” diminish. Likewise, the possibilities of some becoming “very happy” grow in 10% and for the “happy” category, chances are reduced.

The marginal effect for the less happiness categories (“not very happy and ‘unhappy’”) and for the happiest one (“very happy”) show is a U-shaped relation when considering people’s age. In this sense, as age advances, the probabilities in these categories grow. As from a certain age, there is a trajectory reversion probability. The “happiness” category trajectory goes in the opposite direction.

Chart 1

Description of explicative variables and statistical information.

Micro variables	Unit	Mean	Standard deviation	Min.	Max.
Income scale	Between 0 and 10	4.36	2.12	1	0.00
Age	Years, (Years) <sup>2</sup>	41.19	16.02	18	93
Occupation					
Employed	Dummy	0.52	0.50	0.00	1.00
Unemployed	Dummy	0.14	0.35	0.00	1.00
Other occupations	Dummy	0.33	0.47	0.00	1.00
Educational level					
Higher	Dummy	0.17	0.37	0.00	1.00
Basic and secondary	Dummy	0.82	0.38	0.00	1.00
Other schooling levels	Dummy	0.01	0.10	0.00	1.00
Marital status					
Married	Dummy	0.59	0.49	0.00	1.00
Sex					
Male	Dummy	0.40	0.49	0.00	1.00
Ethnic group					
White	Dummy	0.50	0.50	0.00	1.00
Black	Dummy	0.11	0.31	0.00	1.00
Other ethnicities	Dummy	0.40	0.49	0.00	1.00
City size	Dummy	0.34	0.47	0.00	1.00
Macro variables	Units	Mean	Standard deviation	Min.	Max.
Homicide rate	p/100 thousand people	26.99	12.97	11.01	64.71
Suicide rate	p/100 thousand people	4.58	2.36	1.00	11.01
Percentage of poor people	%	6.23	5.78	0.84	27.43
Gini index	Between 0 and 1	0.53	0.04	0.42	0.63
Unemployment rate	%	8.45	2.06	3.70	12.80
Government expenses	R\$	733.31	338.67	264.73	2642.01

Source: elaborated by the authors.

Black people have fewer chances of being “unhappy” or “not very happy, or less happy when compared to other races such as indigenous, mixed or yellow people, thus improving the probability of being ‘very happy’. In turn, the likelihood of being “happy” for black people decreases although such correlation is significant for a level of 8.5%.

## 5. Final considerations

This article analyzed happiness determinants in Brazil based on two different variable categories: one composed of a set of micro-variables, represented by personal characteristics and another one formed by a set of macro-dimensional variables within social and financial aspects.

The study also proved that the Easterlin paradox is also confirmed in Brazil. In fact, besides the existence of a positive correlation between income and happiness, for the “more happiness” categories (3 and 4) we noticed that as from the highest income deciles (5 or 6) happiness proportions tend to be stagnated. We also saw that income is not the sole determinant affecting happiness categories in Brazil.

We also corroborated that income positively affects the likelihood of being happier; however its relevance is lower than the fact of being married or employed.

The probability ratio of being happier compared to being less happy is 1.2 higher for those who are employed when compared to other types of occupations (students, housewives and retired people). This evidence was also noticed in studies developed by [Guo and Hu \(2011\)](#), [Chuerattanakorn \(2007\)](#) and [Di Tella et al. \(2003\)](#) for other countries.

Within the set of personal explicative variables, the highest impact on the probability ratio of being happier in relation to being less happy is explained by the “married” marital status. This likelihood is 1.6 times higher for married

people than for those who remain unmarried. Di Tella et al. (2003) and Corbi and Menezes-Filho (2006) obtained the same result for other countries.

Besides, the study showed that happiness develops a U-shaped trajectory, suggesting that the happiness trajectory is not constant throughout life. Initially, chances of being happier fall as age grows. After certain age, happiness chances start to improve again. This same characteristic had also been detected by Corbi and Menezes-Filho (2006).

In the environment of macro-variables, surprisingly enough, none of them presented a statistically significant level. This may be explained by the little vulnerability of these variables considering that the samples used were from only two different years.

As for marginal effects, when there is a one-decile income increase, the probability of people becoming less happy falls and the chances of being “very happy” grow. For example, the chances of being “very happy” improve 0.02 as the likelihood of feeling “not very happy” decreases in 0.006 as unitary income grows.

Being married and employed reduces the chances of feeling “unhappy” and “not very happy” and increases the probability of being “very happy”.

Marginal effects for the least happiness categories (“not very happy” and “unhappy”) and for the most happiness one (“very happy”) present a U-shaped relation when considering people’s age. In this sense, as age advances, the chances of these categories improve. As from a certain age, there is a trajectory reversion of these probabilities.

Finally, the probability of being “unhappy” or “not very happy” decreases for black people if compared to people of other ethnic groups such as indigenous, mixed or yellow race. On the other hand, the probability of being “very happy” improves.

Based on these results and following what is going on in different countries, income does not seem to be the only determinant of an index that can explain wellness in Brazil. The construction of an index similar to GNH could more realistically assess wellbeing and might become an important tool for public policies seeking to improve welfare in the Brazilian society.

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